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Seminars

REVIEW OF THE PRESIDENT'S ENERGY BUDGET FOR FISCAL YEAR 1977

BEFORE THE

TASK FORCE ON ENERGY

OF THE

COMMITTEE ON THE BUDGET
UNITED STATES SENATE

MARCH 12 AND 15, 1976



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(III)

LETTER OF TRANSMITTAL

U.S. SENATE,
TASK FORCE ON ENERGY,
COMMITTEE ON THE BUDGET,
Washington, D.C., March 29, 1976.

HON. EDMUND S. MUSKIE,
Chairman, Committee on the Budget,
U.S. Senate.

DEAR SENATOR MUSKIE: Attached is the record of hearings the Energy Task Force conducted on March 12 and 13, on "The President's Energy Budget for Fiscal year 1977," in preparation for development of the First Concurrent Budget Resolution for fiscal 1977. Toward that end, the seminars reviewed the Administration's energy budget and considered key policy issues and budget alternatives.

Earlier the Congressional Budget Office was asked to undertake studies on anticipated fiscal 1977 energy issues. Some of these studies were completed in time to be considered in these hearings, the remainder will be considered when completed.

Energy is the lifeblood of the U.S. economy. And no issue appears likely to have greater budgetary impact in the years ahead than energy. Accordingly, the economic and budgetary implications of the President's proposed energy budget deserve careful consideration. For fiscal 1977, the Administration's off-budget funding proposals for energy far exceed the on-budget proposals. The Administration's plan is to stimulate energy production and development of new technologies through Federal incentives for private sector participation. Off-budget arrangements present a smaller current budget but do not change the Government's ultimate liability. They may reduce budgetary control, however. Although not involving a significant increase in spending initially, such off-budget proposals may require considerable Federal expenditures in the future. More information will be available as the legislative process evolves and congressional committees complete examination of the Administration's energy proposals. The need for additional information as a basis for action suggests further consideration before the Second Concurrent Resolution.

Apart from the immediate budget considerations, there are a number of key policy questions related to the President's energy proposals which are of significant interest to the Budget Committee. For example, how much is the Nation going to have to spend to develop sufficient energy supplies? What are the long-range budget implications of Federal investment in the new energy technologies? To what extent is Congress' control over the energy program and Federal spending affected by off-budget financing arrangements?

Historically, the Federal role in energy has been to support basic non-nuclear energy research and technology. In the nuclear area the Government's role has been much more extensive and included production of nuclear technology and material. In view of the growing U.S. reliance on foreign energy supplies, a decision should be made soon concerning the Federal role and the size of the effort to develop new technologies and whether to support them as nuclear power has been supported.

I believe the information gained from these hearings will contribute to the Committee's understanding of the President's energy budget for fiscal 1977 and provide a valuable input for developing the First Concurrent Budget Resolution.

Sincerely,

FRANK E. MOSS, *Chairman.*

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REVIEW OF THE PRESIDENT'S ENERGY BUDGET FOR FISCAL YEAR 1977

FRIDAY, MARCH 12, 1976

U.S. SENATE,
TASK FORCE ON ENERGY,
COMMITTEE ON THE BUDGET,
Washington, D.C.

The task force met at 1:40 p.m., pursuant to notice, in room 357, Russell Senate Office Building, Hon. Frank E. Moss (chairman of the task force) presiding.

Present: Senator Moss.

Staff members present: Lewis J. Ashley, task force coordinator, and Charles D. McQuillen, professional staff member; and Daniel Twomey, counsel, full committee.

Senator Moss. We will begin our hearing.

OPENING STATEMENT OF SENATOR MOSS

In a little over a week the Budget Committee will begin its markup in order to submit the First Concurrent Resolution to the Senate by the 15th of April. Before we can complete these actions, the committee needs to know what the budget should allow for in the energy area.

WHAT THE TASK FORCE WILL CONSIDER

We have the President's budget, which outlines his energy proposals, and we have scheduled a hearing for next Monday, March 15. Mr. Eric R. Zausner, Deputy Administrator, Federal Energy Administration, and Dr. Robert C. Seamans, Jr., Administrator, Energy Research and Development Administration, will present the details of the administration's energy budget for fiscal 1977 at that time.

The energy task force has identified certain energy issues related to the budget, and on the 15th of March we will have the reports from other Senate Committees pursuant to the Budget Act, which I expect will be helpful in this area.

CBO STUDIES

Earlier, the Congressional Budget Office (CBO) was asked to undertake studies dealing with some of the anticipated energy issues such as Outer Continental Shelf (OCS) receipts, synthetic fuels, and uranium enrichment. Some of these study efforts have matured, and others are still underway.

FOCUS OF TODAY'S SESSION

The studies will provide valuable input to the CBO annual report soon to be released. And I believe the task force can benefit from these efforts now.

Consequently, I asked Dr. Rivlin to participate in this seminar this afternoon. This seminar is designed to provide an overview of the energy proposals, indicate the fiscal 1977 budget figures, and relate them to fiscal 1976 and to projections 5 years ahead, identify and focus on some of the key issues in order to provide a framework for discussion and facilitate learning more about the figures and the underlying rationale, and, finally, to outline a high and a low alternative to the President's budget. This should provide another perspective which should be useful in Monday's hearing.

These two sessions should provide valuable information but when we finish Monday, I expect that a number of unanswered questions will still remain. Some energy proposals are still under consideration by the Congress and it is hard to know exactly what the fiscal 1977 budget should provide until we are further along in the legislative process.

LIMITING FACTORS

But despite the inability to have every figure nailed down with the precision we would like, it is important to know what is knowable at this time, to identify the issues, and to minimize the area of uncertainty we have to deal with in the committee budget markup.

We followed a similar approach last year in developing the first concurrent resolution. With this brief introduction let me ask Dr. Rivlin to begin. Alice, you may want to start by introducing the members of your staff who are with you. We are glad to have them.

STATEMENT OF HON. ALICE RIVLIN, DIRECTOR, CONGRESSIONAL BUDGET OFFICE; ACCOMPANIED BY DOUGLAS M. COSTLE, ASSISTANT DIRECTOR, NATURAL RESOURCES AND COMMERCE; NICOLAI TIMENES, JR., DEPUTY ASSISTANT DIRECTOR FOR NATURAL RESOURCES AND COMMERCE; W. DAVID MONTGOMERY, ASSOCIATE ANALYST; RICHARD M. DOWD, PRINCIPAL ANALYST; LAWRENCE H. OPPENHEIMER, PRINCIPAL ANALYST; REGINALD BROWN, PRINCIPAL ANALYST; EDWARD H. RASTATTER, PRINCIPAL ANALYST; RONALD HOFFMAN, DEPUTY ASSISTANT DIRECTOR FOR TAX EXPENDITURE ANALYSIS; AND WILLIAM F. HEDERMAN, ASSOCIATE ANALYST

Dr. RIVLIN. Yes; that is really about all I am going to do. We have organized a briefing which we hope will give the Task Force an overview of what the energy issues are this year, and Douglas Costle, on my left, is going to present that, along with members of his staff. I came along to introduce Douglas Costle.

Mr. COSTLE. Mr. Chairman, we are pleased to be here. I chose this opportunity to bring several members of our staff, because they have never had an opportunity to meet you, and I wanted them to have that opportunity, and for you to have the opportunity to meet them.

The division I have within CBO deals with that part of the budget relating to energy, natural resources, environmental protection, agriculture, transportation, commerce, general science and technology. In the aggregate, this grouping of Federal functions constitutes something less than 9 percent of the entire Federal budget, or roughly \$34 billion for this present fiscal year.

Interestingly, over the last 10 years these activities have received a declining proportionate share of the total Federal budget. Pretty clearly, however, these figures understate the significance of these programs—in that the programs that we deal with represent Federal activities that exert considerable leverage on the private economy and on the capacity of the economy to produce the income that we distribute through the rest of the budget.

ENERGY OUTLAYS AS A PERCENT OF BUDGET

This afternoon we are here to discuss just one of these program areas—energy. Currently energy programs receive less than 1 percent of the total Federal budget, but a growing share. Clearly, energy has been, for the Congress, one of the most controversial and difficult issues to handle.

The key background to congressional concern, of course, has been the dramatic increase over time in our consumption of energy in this country and in the world, and our increased dependence primarily on petroleum and petroleum derivatives to satisfy that growing appetite. At the same time, we are witnessing a decline in our own domestic reserves with respect to present and projected future demand. Presently petroleum makes up about 75 percent of our Nation's energy supplies, and we import about one-third of that petroleum or about 15 percent of our overall energy supplies.

Over the last 3 years there have emerged some elements of consensus about the energy issue which I thought it might be helpful to review in order to set a framework for discussing specific questions that will be before the Congress this year.

The U.S. economy, everyone now realizes, is inextricably energy-intensive, and energy availability and price levels have and will continue to have major impacts on inflation, employment, and the growth of GNP.

REDUCE U.S. RELIANCE ON IMPORTS

The President, after the embargo in 1974, indicated that it should be the goal of this country to achieve independence of foreign energy supplies by 1984. There is, I think it is fair to say, a general consensus that U.S. reliance on imports should be reduced. As yet, however, there is no general consensus as to the specifics on: (1) what level of imports is acceptable; (2) the time needed to get down to the levels; and (3) the costs, economic and environmental, associated with getting there.

ENERGY OUTLOOK

I think it is also fair to summarize our energy outlook in the following manner: First, demand will continue to grow, although at rates below those experienced since World War II. Easily tapped domestic supplies of oil and gas will continue to dwindle. Extraction of less accessible supplies will be more expensive and more technologically difficult.

Alternative energy sources will also be more costly and in some cases will require major technological advances and financial backing to become commercially available. This is true even of the two alternatives, coal and nuclear, that are closest to being, or are regarded as, commercially viable today. Both still face hurdles. The United States has ample supplies of coal, but significant questions remain concern-

ing the costs of strip mining, transportation systems to move coal, and conversion to preferable liquid and gaseous forms. Uranium supplies will become more scarce; fusion is not yet a proven technology; and concerns continue about nuclear safety, proliferation, and the nuclear fuel cycle—specifically, reprocessing and waste disposal.

Plentiful foreign oil supplies will continue to be highly priced, but will still cost less than most of the presently available alternatives.

CONGRESS ACTS ON ENERGY ECONOMY

Given this outlook, there is no question that the United States will move to an energy economy that is much less dependent over time on oil and gas and much more reliant on alternative sources. The question is how quickly and at what price—social, economic, and environmental?

In the last 3 years Congress has acted vigorously to deal with these issues: (1) it reorganized executive branch energy programs, creating the Federal Energy Administration (FEA), the Energy Research and Development Administration (ERDA), and the Nuclear Regulatory Commission (NRC); (2) it has acted to manage the price of oil in order to minimize the effects of rising prices on domestic economic recovery; (3) it has mandated certain conservation measures and encouraged others to moderate the rate of increase in overall demand for energy; and (4) it has provided steadily increasing budget support for Federal energy programs, particularly in the area of bringing along new technologies that are the key to our long-range energy future.

ENERGY OUTLAYS INCREASING

To illustrate this, in fiscal year 1974, total Federal outlays for energy were \$606 million. In fiscal year 1975, those tripled to \$1.6 billion. In fiscal year 1976, they rose again by \$1 billion to a total, at least in the President's estimate, of \$2.6 billion. In fiscal year 1977 the President's budget request would lead to outlays of approximately \$3.4 billion, or a 30-percent increase over last year.

ENERGY ISSUES

Today we will cover several issues that will come before you this year:

First: Energy research and development: The key issues here are our overall level of effort, including our commitment to large-scale demonstration of new technologies; and the mix of technologies that we support through the ERDA budget.

Second: We will talk about the budget implications of the Energy Policy and Conservation Act (EPCA) passed and signed after the time at which the President's budget was put together. There are a couple of significant, big ticket items here—petroleum storage, and the way in which the development of the naval petroleum reserves are handled.

Third: Outer Continental Shelf (OCS) receipts: It appears, again, that these will be an issue for the markup on the first and second concurrent resolutions.

Fourth: Uranium enrichment: The key issue here is the acknowledged need for expansion of our enrichment capacity in this country, and the question of who should own and build that capacity. Should it

be privatized or should it remain in Government ownership and control?

Fifth: Energy financing in general: The President has put forward a proposal to establish an Energy Independence Agency (EIA) which would significantly facilitate commercial development of energy systems.

Sixth: We will discuss very specific proposals dealing with commercialization of synthetic fuels which have been put forward.

These last three issues I have mentioned are of considerable importance, and are now presently before the Congress. As proposed by the President, they would not result in significant on-budget expenditures initially. However, they would represent dramatic new Federal departures carrying with them the potential of considerable leverage on the commercialization of energy technology, and significant contingent liabilities to future Federal budgets.

The issue of whether they should be treated on-budget or off-budget is an issue before the Budget Committees this spring, and the dollars involved are significant enough to make it a likely critical issue.

Since we need a specific starting point to get into these issues, the best one might be where the Congress last left off, and that is with the second concurrent resolution. I would like to turn to Mr. Nicolai Timenes, my deputy, who will get us into this.

Senator Moss. Go ahead, Mr. Timenes.

Mr. TIMENES. Thank you. We have provided you a notebook containing briefing charts.¹ It also contains brief summaries of those papers which we have completed, and we will have additional papers for the use of the staff early next week.

Turning to page 4 [see p. 29] in that report, the second concurrent resolution does not address energy specifically. Rather, it sets a target for the overall function 300—energy, environment, and natural resources—with \$18 billion budget authority in fiscal 1976.

The estimates of the subfunction detail that we have here are those which result from our scorekeeping and understanding of the way that the individual appropriation legislation is taking place; using those estimates, the allowance for the energy function was \$3.2 billion in budget authority in fiscal 1976.

Not shown here are receipts from rents and royalties on the OCS, which are in subfunction 953, or certain other energy-related activities which are carried in other functions.

Page 5 [see p. 30] shows the general content of those expenditures for fiscal 1976 in subfunction 305. The general operating programs listed are activities of the FEA and of ERDA and a number of smaller efforts. The regulatory activities of the NRC and the Federal Power Commission (FPC) are shown there as well.

The largest item, 80 percent in budget authority and 70 percent in outlays, is devoted to research and development.

On page 6 [see p. 31] we begin the comparison of the mark in the second concurrent resolution with the estimates for fiscal 1977. That will be the burden of our balance of our presentation today.

The differences which I will note between the mark for 1976 as presented in the second concurrent resolution and in the President's budget derive from some comparatively modest accounting changes.

¹ See p. 27.

Certain activities were transferred into function 305 in the President's 1977 budget, and he has revised the 1976 estimates accordingly.

For 1977 the President has requested \$4 billion in budget authority; this represents an increase over the current policy estimate. Beyond that request, there are several other potential additions which could come about as a result of congressional decisions on the various policy issues, which Mr. Costle just indicated.

As a matter of convenience, we might note also on the next page [see p. 32] an alternative method of the presentation of energy budgets, which the administration uses, totaling some \$10 billion in fiscal year 1977. This figure results from the inclusion of a number of other activities—such as the electric power generation activities of the water programs—which can be construed as being energy-related.

Page 8 [see p. 33] refers to function 305 for fiscal year 1977. There would be an increase in general operating programs, primarily as a result of further increases in planned capacity to the Nation's uranium enrichment facilities, which are owned and managed by ERDA. The regulation activities are small, and are expected to remain so.

Research and development gets the bulk of the increase to \$3.1 billion in budget authority.

ENERGY RESEARCH AND DEVELOPMENT

A new category appearing in the President's 1977 budget is for the Energy Independence Authority. This reflects the on-budget implications of the operations of an agency which is basically off-budget. This would be the net gains or losses, anticipated in 1977 to be a net loss of about \$40 million.

ENERGY INDEPENDENCE AUTHORITY

With that as a general background, we would like to proceed now to the specific issues. The first of these is energy research and development, which as I have noted accounts for some 80 percent of the current R. & D. budget, and is the cutting edge of the development of the new technology for the future.

I now turn to Dr. Richard Dowd.

Senator Moss. Mr. Dowd?

Dr. Dowd. Senator, if you will turn to page 10 [see p. 35] we have restated the issues that have come up. What should be the level of funding, and a subsidiary issue to that: To what extent should the government support large R. & D. projects, and what should the mix of technologies that the R. & D. budget supports be?

Those are two very critical issues.

Page 11 [see p. 36] shows some of the budget numbers that have occurred both in the second concurrent resolution and the President's budget for fiscal years 1976 and 1977, and those presented in the President's budget request.

R. & D. is the largest single item in account 305. It is an exception to the general philosophy that the private sector should have an increasingly larger role in energy development because R. & D. is the early stage of that. The priority that has been placed on this can be seen by the increase in funds requested for R. & D., which is about 30 percent, both in budget authority and outlays of the 1977 fiscal year over 1976.

It certainly is a worthwhile question to ask—"For that sum of money what do we get?" On page 12 [see p. 37] we have listed in the President's fiscal 1977 budget proposals for R. & D. funding by specific program.

We have listed the budget authority in each of the programs in the R. & D. area. Let me mention what those tend to include.

ENERGY R. & D. PROGRAMS

The fossil energy program has had a long history of development, particularly in coal, and it includes now some significant demonstrations that are coming on-line, particularly with a clean boiler fuel demonstration, which is designed to burn high-sulfur fuel or coal safely, and beginning of work for architecture and engineering for two coal gasification projects.

This particular budget is the most mature of the nonnuclear programs.

Geothermal and solar are relatively new, and they reflect efforts at the pilot stage, such things as a 10-megawatt solar electric generator. The geothermal program is in much the same state—very early development.

Conservation listed here is the only program of energy R. & D. that attempts to manage demand growth. This program is very new and does not reflect much in the way of large demonstration projects at the moment. At the moment it illustrates the small pieces.

The fusion power program consists both of laser fusion and magnetic confinement, which includes the Tokamak Reactor at Princeton, a fusion test reactor which is listed in the budget.

The nuclear fuel cycle is a research effort designed to close the loop in the uranium cycle, to improve the storage of nuclear wastes, and to do the reprocessing better. A good part of this is devoted to support for the breeder program.

The fission reactor program is designed to implement a breeder program. There is a small amount for light water reactors, but the major thrust of that program is the development of a breeder, in which the Clinch River Breeder Reactor, now in development with ground-breaking expected in 1978, is a key element.

Uranium enrichment for the most part is an attempt to produce processes which will enrich uranium at lower costs. We will talk about the uranium enrichment issue in a separate discussion in a few minutes.

Insofar as the mix is concerned, there are a couple of comments that are useful to make at this point.

The nuclear share of direct R. & D. has increased slightly in 1977 over 1976. It is up to 65 percent of the direct energy, over the 62 percent in 1966. It has increased in that time from about \$1 billion last year to about \$1.5 billion this year, a 50-percent increase.

The nonnuclear program has increased from about \$600 million last year to \$800 million this year, an increase of about 30 percent. Much of the increase in both the nuclear and nonnuclear programs is attributable to larger-scale demonstrations that have begun to have their influence on budgets.

I mentioned the Clinch River Breeder Reactor, which is certainly a big item in the program, and the clean boiler demonstration program, and the beginning work for the gasification program—those come in there. In addition, it is worthwhile noting from budget history tables

we can see that the President has passed through varying percentages of ERDA agency requests for programs, and these varying percentages may indicate an inclination of the administration for one mix or another of technology.

PROGRAM PRIORITIES

At the moment it appears that that tendency is toward nuclear power. If one compares the program levels, the President passed through 90 percent of ERDA's request for the fission reactor program, but only 50 percent for the conservation program to Congress. It is possible—that that being so, either they are hesitant to vigorously pursue a nonnuclear program or in their judgment there are other impediments to the efficient spending of that money, such as the technical opportunities that exist or the ability to manage such a large increase in money so quickly.

The differences between the agency proposals, however, and the President's passthrough of those requests may well suggest amounts that could be potentially added to the budget by Congress.

If you will turn back for a moment to page 11 [see p. 36] you will see that I have included on-budget additions potentially between \$0.5 billion and \$1.1 billion. That represents a difference of half a billion dollars in nonnuclear programs between what the agency requested and what the President passed through, and an additional \$600 million in the nuclear program that the agency requested and the President cut out.

So it is possible in Congress this year, if there is an attempt to alter in any way the mix of technologies that are being supported by the present energy research and development program, there could be additions of this size.

Are there any questions, Senator?

Senator Moss. The percentage of nonnuclear R. & D. has gone down then?

Dr. Dowd. The percentage of nonnuclear R. & D. has gone down slightly, that is true.

Mr. COSTLE. Total dollars, however, have gone up.

Senator Moss. Yes, I see that, but percentagewise it has gone down.

Mr. COSTLE. Thank you.

Dr. Dowd. We will turn to Reginald Brown.

Mr. BROWN. Good afternoon, Senator.

Senator Moss. Good afternoon.

ENERGY POLICY AND CONSERVATION ACT

Mr. BROWN. If you turn to page 13 [see p. 38] we have listed the major issues concerning the Energy Policy and Conservation Act and some of the programs affected by it.

On page 14 [see p. 39] we have summarized the budget impact of EPCA, in conjunction with the budget impact of H.R. 49, which has not passed yet, but which is in conference.

Page 15 [see p. 40] details the programs affected, and I would like to highlight three of these programs: storage, incentives for coal, and receipts.

STRATEGIC STORAGE

The major budget issue in the act comes under the development question where we highlight strategic storage. The Congress is sched-

uled to consider the plan for implementation of the early storage program which is mandated by the act sometime later this month, and we figure that approval of that plan can result in as much as \$300 million in budget authority in 1976 and \$1 billion in 1977.

COST OF STRATEGIC OIL RESERVES

The total cost for full implementation of storage, that is, the full-blown plan, may reach as high as \$6.7 billion over a 6- to 7-year period.

The key question confronting the Congress in the immediate future, then, is how much budget authority to provide for the early storage plan, the first increment in storage. The cost of storage will largely be determined by the cost of fuels we are putting in the facilities.

Now, the EPCA, in conjunction with H.R. 49, allows the President to use production from the naval petroleum reserves for storage, but it doesn't require him to do so. Short of using industry-owned fuel, which is also permitted by EPCA, the production from the petroleum reserves is by far the cheapest source of fuel.

The most expensive source of fuel, of course, is imported oil. Whether we end up paying \$200 million or \$1 billion depends on the source of fuel, essentially.

INCENTIVES FOR COAL

In addition to storage, the other item listed, "incentives for coal," has budget authority of \$750 million for loan guarantees for incentives for coal development. The only real question here is whether that will be treated on- or off-budget. On-budget treatment would distinguish it from the President's Energy Independence Authority.

REVENUES FROM NAVAL PETROLEUM RESERVE

Last, the question of receipts: The President's 1977 budget estimates receipts from the sale of petroleum from the naval reserve at \$10 a barrel. That yields \$700 million.

We have adjusted those receipts downward, as you see. The difference we anticipate will be larger in downstream years, between the \$10 estimate and the \$7.66 per barrel which we use.

Those receipts may or may not be sufficient to fully fund a storage program. An expensive storage program using high cost oil could not really be covered by receipts of oil sold at \$7.66 per barrel.

If there are no questions, Senator, I would like to pass back to Dr Dowd, who will discuss uranium enrichment.

Senator Moss. All right.

URANIUM ENRICHMENT

Dr. Dowd. If you will turn to page 16 [see p. 41] the key issue before Congress on uranium enrichment this year is, "Should the Federal Government continue to own and manage all U.S. enrichment as it does now, or should future additions to capacity be the prime responsibility of the private sector?"

On page 17 [see p. 42] we have included the present budget framework for uranium enrichment. At the moment, the United States owns and operates three enrichment plants, and it services all U.S. nuclear powerplants and about two-thirds of all foreign powerplants.

It has plans underway to expand its total capacity by about 60 percent. It anticipates and has already signed contracts with customers to use all of that capacity, both existing and planned.

We have done an analysis of this as you mentioned in your earlier remarks and a summary of that analysis appears in the back of your notebook [see p. 82].

Let me briefly discuss what the major issues involved here are.

One of the questions is: How much enrichment capacity is needed? This depends on many factors, including the growth of nuclear power and the percentage of foreign market that is served. At present, the United States has, as I said, about two-thirds of the foreign market. It is planned in the future that this should be about 35 percent. It depends, therefore, on the growth of foreign nuclear power as well.

Depending on the growth, and on the percentage of foreign market, one can project the need for from 2 to 10 enrichment capacity facilities by the end of the century, all large scale of the same size as each of the 3 in the United States right now.

Now, that is a big spread, and it depends a good bit on the growth that is going to occur in nuclear power.

URANIUM ENRICHMENT—DIFFUSION OR CENTRIFUGE

Competing for the process to be used in those enrichment facilities are two different technologies, a diffusion technique which the United States has used for some 30 years and which is probably going to be the process used in the next enrichment facility, whether it is private or Government, and a centrifuge technology that has the potential of producing enrichment capacity at substantially lower electrical costs.

Each plant using the present enrichment technology uses the full output from approximately two large nuclear powerplants, whereas a centrifuge plant would need only about one-tenth of that power. Capital costs seem to be the same, but there are major questions yet to be resolved, like issues of maintenance on very-fast-rotating components.

We have questions of competing technology. The centrifuge has not been put on a commercial scale by industry or by the Government.

We looked at these in terms of three major options. We considered the options of all new capacity private, all new capacity Government, and a mixed option with the next uranium enrichment plant, it being diffusion, built by the Government, and the centrifuge built by private industry.

COST OF URANIUM ENRICHMENT PLANTS

The budget impacts of that are in the back of the notebook. Briefly, if Government built the capacity, one could expect to have increasing Government expenditure, getting up to \$2 billion a year in the mid-1980s.

However, very shortly after that, the revenues from the enrichment facilities would overtake costs and by the early 1990s revenues could exceed cost by some \$3 billion a year. So it could provide revenues to the United States. That is in constant dollars.

If it were all private, if every new capacity addition that was built were private, then there would be no budget outlays, but there would be some tax expenditures due to tax investment credits, and

there would ultimately be some royalties to the Government and some taxes from profits.

Roughly, by the mid-1980s, the tax expenditures would be on the order of \$200 million for a few years. By the early 1990s, the net annual revenues to the Government, both taxes and royalties, would reach about \$700 million.

If it were a mixed option, with the private sector building the more risky centrifuge and the Government building the mature diffusion plant, then it is likely that one would have a budgetary impact which falls in between the other two. In that case, the budgetary impact for the Government would be rising budget outlays to about \$750 million very early in the 1980s, falling very quickly, and revenues overtaking expenditure about the late 1980s and then rising to a level of about \$800 million a year thereafter.

NUCLEAR FUEL ASSURANCE ACT—BUDGET IMPACT

The Nuclear Fuel Assurance Act is the vehicle by which the President would like to privatize enrichment activities. It proposes to do so with new assurances. The passage of that bill, or lack of passage, will have direct budget impact. If it passes, \$8 billion of contingent impact authority would be approved. This is the first issue of several that will be discussed today that have to do with on- and off-budget questions, and I will not deal with it at great length except to note that at present the administration considers that this particular item would not be scored as budget authority, because it is a contingency, and hence under the definition of budget authority should not be counted.

There are others who may feel that this interpretation does not meet the requirements of the Congressional Budget Act and ought to be scored as budget authority. Clearly \$8 billion is a significant sum of money to decide one way or the other.

If the Nuclear Fuel Act fails to gain passage, then there would be a budgetary impact by having the Government build the next enrichment facility.

Under those circumstances, it is likely that in fiscal year 1977 there would be a requirement for about \$400 million in budget authority and \$100 million in outlays.

Mr. COSTLE. Those cost projections are in the summary, Mr. Chairman. It is interesting, because in the out years, the net revenue curves do not differ significantly until after 1994.

FINANCING ENERGY DEVELOPMENT

Mr. TIMENES. The next presentation concerns a broad array of incentives for financing energy development, which Dr. David Montgomery will address.

Dr. MONTGOMERY. Good afternoon, Senator.

If you will turn to page 18 of the book [see p. 43] I will be discussing three programs, a synthetic fuels commercialization program, an energy independence authority, and a program of tax relief for electric utilities. All of them raise in different forms a single question: To what extent should the Federal Government assist in the financing of energy development in the private sector?

RELIANCE ON PRIVATE SECTOR

The President's policy in this regard appears to be to place very heavy reliance on private industry to achieve his energy policy objectives. In particular, it appears that to lower imports or respond to higher prices of energy, there will be necessary some very large changes in the patterns in which we produce and use energy. Large investments over the next decade would be needed to expand domestic energy production and to alter the technology with which we produce energy.

A certain amount of concern has been expressed over the ability or the willingness of the private sector to provide this investment of \$600 billion. There might be difficulties in obtaining financing for this amount of investment, including unwillingness of banks to loan money to certain kinds of ventures or difficulty of selling stock in a depressed market.

In some cases, difficulties appear to be associated with the risk and the very large scale of the new technology which might be involved. In other cases, it appears that energy prices, either world energy prices or the prices resulting from various regulatory actions, might not be sufficient to make some of these investments profitable.

These three programs address these kinds of questions.

SYNTHETIC FUELS COMMERCIALIZATION PROGRAM

If you would, turn to page 19 [see p. 44]. The synthetic fuels commercialization program raises the issue of whether the Government should provide financial guarantees specifically to stimulate investment in producing oil and gas from domestic reserves of coal, oil shale and urban waste.

The United States has in the past relied heavily on oil and gas while not utilizing other, more abundant sources of energy. Technologies for producing gas from coal, for example, have existed for a number of years, and new technologies are in the offing. However, none are in current operation at a scale that would provide significant amounts of energy.

Three questions which may be asked are: Is it desirable to produce energy from those sources; will the private sector do so—and it appears it will not—and what incentives would be necessary to stimulate private investment?

PROPOSALS FOR FINANCING ENERGY DEVELOPMENT

The problems I mentioned as obstacles to financing energy development all seem to apply in this area. To remove those obstacles the proposed programs include such actions as loan guarantees, price supports for the sale of synthetic fuels, and in some cases outright grants to share in the costs of synthetic fuel.

All the proposed programs entail small initial outlays. If you would, turn to page 20 [see p. 45]. It might take up to \$3 million in fiscal year 1977 to administer the program. There are no actual program expenditures anticipated in the first year. On the other hand, there is the possibility of large future outlays. If loan guaran-

tees were called or price supports were needed sometime after 1980, a commitment could have been made to large expenditures.

These are quite uncertain, much like the outlays in regard to the uranium enrichment program. They are likely to be much smaller than the commitments that the government actually undertakes in the guarantees.

The President's budget, to get to the specifics, has, or proposes that in fiscal year 1976, a budget authority of \$500 million to be used for loan guarantees should be created.

THE PRESIDENT'S SYNTHETIC FUELS PROPOSALS

Now, back in the fall, a systematic program for synthetic fuels was proposed by the President, and if we see the budget request as the beginning of that program, this \$500 million would also be just a beginning. There is nothing shown for fiscal year 1977, because the President proposes to transfer the synthetic fuels program to an Energy Independence Authority. I will discuss that particular proposal next.

One reason why the program was included in the fiscal year 1976 budget and put on the budget came out in hearings in October before the House Committee on Science and Technology. The President considers this program to be sufficiently important that even if an Energy Independence Authority were not created, he would want this program to be going on.

LOAN GUARANTEES

The program which was outlined in the fall could have involved up to \$2.6 billion in outstanding loan guarantees. That would be the maximum amount outstanding at any one time, and perhaps up to \$6 billion in price support payments could be conceivable. That level of payments could be required if the OPEC cartel fell apart and world energy prices dropped.

On page 20 [see p. 45] we see what the administration proposed as the amount of budget authority they felt was sufficient to keep the program going.

An alternative was proposed in a bill introduced in February, H.R. 12112. This bill would provide \$2 billion in loan guarantees, and requires that funds must be appropriated before the guarantees could be issued. This proposal could result in the addition of up to \$2 billion to the budget.

FINANCING EIA

It has been proposed that the synthetic fuels commercialization program be transferred to an independent corporation designed to give large scale aid to private energy development. That proposed Energy Independence Authority would have \$100 billion in assets to be provided by the Treasury and private money markets.

On page 22 [see p. 47] the potential additions off budget of \$83 billion in budget authority would represent the \$75 billion in borrowing authority proposed for the EIA plus an \$8 billion contribution from the Treasury. The Treasury's contribution would not appear in

the budget, but it appears that it would count against the public debt ceiling.

ROLE OF ENERGY INDEPENDENCE AUTHORITY

What could the EIA do? It is a very large program, but some specific methods and criteria for project selection are detailed in the bill.

Generally, the EIA could offer price supports and loan guarantees, could make direct investments in enterprises, and could do a limited amount of purchase and lease back of facilities.

The criteria which it is intended to use fall in two groups. A project must pass on both of these criteria before it could be funded. One criterion is its inability to be financed in the private sector on commercially reasonable terms. That is, if the project could only borrow money or raise equity by paying a very much higher rate of interest than was normally charged credit-worthy borrowers, it would be eligible. It also should offer a reasonable prospect of repayment to the EIA. This provision places some limitations on the speculations that the EIA would be allowed to support.

The other criteria relate to the technical nature of projects. The projects which would be eligible include most energy activities outside the oil and gas sector. In particular, any commercialization program would be eligible. It appears that most activities relating to the nuclear industry or the generation of electricity from nuclear energy or coal would be eligible. Projects too large to be financed by the private sector would be eligible. For instance, an Alaska natural gas pipeline could be eligible.

There are a variety of other eligible projects. Projects involving regulatory or institutional innovations, for example, an energy park, would be eligible. Environmental protection measures related to projects otherwise eligible could also be assisted.

BUDGET IMPACT OF EIA

To illustrate this, we could look at the President's budget request. We note that about \$42 million would be on budget. The reason is that although the general activities of the Energy Independence Authority would be off budget, each year its net gains or losses would be counted on the budget and would be counted both as budget authority and outlays in that year.

One issue might be whether it is desirable to have that provision, or desirable to have an off-budget agency able to make decisions about the size of the impact on the budget. As far as I can tell, those impacts would be literally uncontrollable, because they are determined by the decisions of the directors of the Energy Independence Authority.

TAX RELIEF FOR ELECTRIC UTILITIES

One of the major areas in which it appears likely the Energy Independence Authority could be active is in assisting electric utilities in financing the construction of new generating capacity. The next subject I will discuss, tax relief for electric utilities, also addresses these problems. The two approaches are in many ways alternatives to each other. A third alternative would be on-budget direct assistance. A fourth alternative would be for the Federal Government not to

be involved at all, but for the State regulatory commissions themselves to undertake actions to remedy any financial difficulties that existed.

When these proposals were made, electric utilities in 1974 were in a position of severe financial distress. There were construction cut-backs which may have been due either to financial difficulties or to a discovery that demand was not growing as fast as was thought. But utilities were certainly suffering from low stock prices and having difficulty selling bonds.

Now things seem to have improved a bit. The FEA in its recent report on the 1976 national energy outlook indicated that it was relatively optimistic about the general shape of the electric utility industry, but that specific utilities might be in serious need of assistance. This is a perspective for looking at page 24 [see p. 49] which indicates that a revenue loss of about \$800 million in fiscal year 1977 is anticipated if these tax incentives were provided.

One difficulty of estimating that figure is that currently many electric utilities have unused tax credits from the existing investment tax credit. These utilities might have difficulty in utilizing the further tax relief which is provided.

REGULATION CHANGES

One final point in the bill is that none of these tax cuts would be allowed to an electric utility unless its regulatory commission made some changes in the nature of regulations, specifically including construction work in progress in the rate base. That could have the effect of raising electricity utility revenues, in addition to the tax benefits that are provided.

OUTER CONTINENTAL SHELF REVENUES

I will now turn the floor over to Mr. Larry Oppenheimer, who will discuss the OCS revenues.

MR. OPPENHEIMER. Mr. Chairman, I will be brief. As you know, the OCS receipts differ from the other issues we talked about, in that they are not a policy issue. They are simply a matter of projecting receipts.

The question is what the estimates of the OCS receipts ought to be for this and for the next fiscal year.

Now, on page 26 [see p. 51] I have detailed a brief history of what was projected for receipts in fiscal 1976. The President's budget predicted \$8 billion. By November, however, Concurrent Resolution 2 predicted only \$4.5 billion, because the conferees knew the schedule of lease sales had been delayed.

After the recent sale in California, the CBO predicted that receipts would actually total between \$2.2 billion and \$2.8 billion in fiscal 1976. I have detailed that on page 27 [see p. 52].

For the next fiscal year, the President's budget anticipates receipts of \$6 billion. The CBO projection anticipates receipts of somewhat less than half of that.

I would like to quickly explain the reasons for the uncertainties and for the past errors which, as you can see, amount to several billion dollars.

First, there have been delays in the anticipated schedule. As a result, there have been fewer sales per year. The sale areas are smaller than was expected, and there have been stipulations and restrictions placed on lands that have been leased.

Second, receipts per sale have been greatly overestimated. In the past, we anticipated that receipts would equal those of comparable magnitude in the Gulf of Mexico. However, the sales this year are in what we call frontier areas, in California, off the coast of Alaska, or in the Atlantic Ocean. Quite simply, the costs, revenues, and reserves in those areas do not bear the traditional relationships which they have in the Gulf of Mexico.

Consequently, we anticipate receipts next year, as I mentioned, to be less than half the amounts predicted in the President's budget.

Now, Mr. Timenes will sum up and recapitulate the issues.

Mr. TIMENES. We have talked to a broad variety of initiatives and price tags, and ways of financing, on or off budget. We cannot presume to anticipate what the committees would recommend to you, but I would like to suggest the broad scope of some of the possible initiatives.

ENERGY POLICY AND CONSERVATION ACT

I would point out the potential problems that could arise in fiscal 1976 as a result of full realization of the effects of the Energy Policy and Conservation Act, and possibly of some synthetic fuel legislation.

For fiscal 1977, I think the important budget authority impacts would be due to energy R. & D. and the Energy Policy and Conservation Act.

Mr. COSTLE. Senator, I would like to close our presentation at this point. I would like to thank the staff of the Budget Committee and Lew Ashley for the extraordinary help they have been to us over the last few months as we have worked our way through these issues. They have been extremely helpful.

Senator Moss. We are very pleased that you have worked with the staff, and they have had the help of the CBO. We are all trying to get a handle on this important energy area. It is a very difficult thing to do, as you pointed out in your briefing.

Your presentation today has been very good. Many points have been clarified and the budget figures we are going to have to deal with pointed up.

OFF-BUDGET PRIORITIES

If synthetic fuels, uranium enrichment and EIA are handled off budget, how can the Federal budget process deal realistically with such priorities?

Mr. COSTLE. It becomes very, very difficult. The way in which it goes off budget could make a difference. In the case of EIA, the net revenues or net losses in any given year, as David indicated, are subject to essentially the determination of the Board of Directors. That would appear in the budget almost in the manner of an entitlement program.

In the case of uranium enrichment, it will depend an awful lot on how you score. That is probably a good example. If the Congress were to decide that OMB's interpretation of the Budget Act is erro-

neous and would elect, then, to score the uranium enrichment program, there is \$8 billion there in new BA, although there is a low probability of actual outlays.

I expect that the bottom line, Senator, is how the Congress feels it wants to deal with these things. In something as large as the EIA, we would be launching a very large federally guaranteed effort with literally very little way to control it from year to year on budget.

Senator Moss. It throws out of kilter the relationship of priorities, too, does it not?

Mr. COSTLE. That is entirely possible.

NEED FOR FEDERAL FUNDING

Senator Moss. The Alyeska Co. providing the pipeline in Alaska is a private corporation. Why will some large projects fail to find sufficient funding in the future?

Dr. MONTGOMERY. I am not at all sure that there would be any difficulty with an Alaskan natural gas pipeline. Such pipelines do have a history of being financed. The original oil pipeline was financed privately.

The areas where I think financing might be difficult are those which entail large expenditures on the development of new technologies. That is one of the justifications given to both the synthetic fuels program and to the uranium enrichment program. However, in the uranium enrichment case, the technology to be used in the private sector to build the first plant is the same technology that was used by the Government successfully in the past.

I think it is difficult to tell whether or not financing is going to be available, though in both of these cases, investment bankers have testified that without certain kinds of guarantees they feel that the financial community would be unwilling to invest large sums to buy bonds. That does leave the alternative of equity financing which large companies probably could find a way to do.

Looking through that \$100 billion I mentioned, it is difficult to add up more than, say, \$50 billion outside the electric utilities industry that would potentially face financing difficulties. One can work through the detail that is in the FEA's 1976 National Energy Outlook to try to work that out.

COST FACTOR IN STRATEGIC PETROLEUM RESERVE

Senator Moss. You mentioned establishment of the strategic petroleum reserve, as part of the Energy Policy and Conservation Act, and indicated the significance of the source of the oil as a factor in the cost of the reserve.

I wish you would go into that in a little more detail. It is of considerable concern whether the price of the oil to be stored is \$7 oil or say \$12 oil.

What is the situation?

Mr. COSTLE. We are preparing a background paper for the staff specifically on that which will address those questions. I think we have some of the answers now.

Reg, would you like to respond?

SOURCES OF OIL

Mr. BROWN. For oil from the Naval petroleum reserves, the cost of production of that runs from \$1.50 to \$2 a barrel. This is not the cost that is used to calculate the budget addition to H.R. 49, which is more like 50 cents a barrel, so some care should be exercised there.

That oil can be either transported to the storage facilities, or exchanged for oil already near those facilities.

Another source would be buying the oil off the domestic market at current market prices, and that is \$7.60, or, rather, \$7.66

Another source would be royalty oil, which is limited in quantity, something like 80 million barrels a year, and currently going for something around \$7 a barrel. It wouldn't be sufficient to fill the whole storage program. Once you use up those, you are left with imported oil up to \$12 or \$14 a barrel of oil.

The final source, of course, is that the EPCA does allow for the establishment of an industrial reserve, which FEA currently calculates, based on what is allowed there, could amount to something like 180 million barrels, which wouldn't be enough for the whole program.

They don't really know whether that would be feasible based on the impact of those regulations on the firms and so forth.

So, those are the kinds of options.

As of this day, it is my understanding that the agency hasn't really decided which way it is going to go on obtaining the fuels.

One would hope they would take the least-cost approach in obtaining those fuels.

Senator Moss. Dan?

BUDGET IMPACT AND SOURCES OF OIL

Mr. TWOMEY. Is there a significant difference in effect on the budget from the source of oil?

If you are talking about the Naval reserve which the Government would gain the revenues from, or the royalty oil, which the Government would again sell near the market price, is there a difference in the Federal budget or in the economic impact of creating the reserve?

Mr. BROWN. I am not sure about that.

Mr. TIMENES. There are a couple of ways of thinking about that. First: You are going to store oil that is, in some sense, in excess of your needs, although we don't have any that is excess to our needs at this point. That means you are distorting the market, if you can't find some source that you didn't have before.

If we are talking about drawing from increased production in Elk Hills, then this is oil that was not there before.

If we start taking over royalty oil instead of letting it go on the market and taking money for it, then the market will want to make up that oil somewhere else, presumably by increasing imports.

That is point 1. Point 2, with respect to the budgetary impact, if this oil—if it is worth \$7.66 and the Government would otherwise sell it for that price, be it Elk Hills oil or royalty oil, for example, then that is really the cost, although there may be some difference in how you score it within the budget.

Mr. TWOMEY. Is the impact on the Federal budget essentially the same whether I buy it on the market or use royalty oil?

Mr. TIMENES. Yes.

COST OF EPCA—1976 AND 1977

Senator Moss. I understand Mr. Zausner told the House Budget Committee last week that the administration is probably going to request a budget supplemental of about \$300 million in fiscal 1976 and about \$1 billion in fiscal 1977 to implement EPCA.

Are these figures realistic and would they be supplemental in both cases?

Mr. TIMENES. It is difficult for us to make an independent judgment on that subject.

It is clear that some of the activities would need to be undertaken, for example, to restore the cuts in the FEA regulatory mechanisms which were made in anticipation of the expiration of the original pricing act.

The more expensive items, the storage program in particular, are very difficult ones to estimate.

The cost of storage, of course, depends on the cost of fill. It also depends on the cost of the storage facilities themselves, and particularly on the rate at which those storage facilities can be made available, which is an engineering judgment, or a matter of construction.

Third: There is the amount of advance funding which you may wish to provide for a given level of outlays. One knows that, for example, in those estimates the budget authority estimates are much larger than the corresponding outlays. They are going to have to get a fair amount of money in advance of actually laying it out, so that they can program properly.

We don't have any real judgment on that, not yet having seen the report.

Mr. COSTLE. Once the administration shares the specifics of how they intend to proceed, I think it would be possible to make some evaluations. I think Mr. Zausner's figures are within a realistic range, but so far we haven't got enough specifics to do much more than say, "Sure, you could have a program that looked like that, but you could also have a program that looked a lot different."

OFF- AND ON-BUDGET FINANCING

Senator Moss. Financing is a key part of the new energy proposals. If we added up all the costs, what sort of budget impact are we talking about?

Mr. COSTLE. Off budget or on budget? Are you speaking specifically of the on budget?

Senator Moss. Both, I would think.

Mr. ASHLEY. Let me add to that. The President's proposals are a mixed bag—on and off budget. If Congress accepts them as they are that has one effect. But if Congress were to decide to put them on budget that has an impact that is much larger. Given these two assumptions, what is the range of the possible impact on the budget?

Mr. TIMENES. I should have an envelope on which to write these numbers, because it is that level of prudence that one has to observe here.

At a minimum, there should be full funding for the Energy Policy and Conservation Act. This would mean at least \$400 million in budget authority, and perhaps \$1 billion. Also, if a decision is made not to pass the Nuclear Fuel Assurance Act, then another \$200 million will have to be added for new Federal capacity.

At the high end of the range, those we know for certain to be scored on budget, such as \$1 billion for EPCA, up to \$1 billion more for energy R. & D. and additions to uranium enrichment capacity, would come to a total of about \$2.5 billion over and above the \$4 billion in budget authority requested by the President.

If you add in \$2 billion for on-budget treatment of synthetic fuels, all in this year, that could go up to \$4.5 billion so that would be roughly double what the President has requested. It could double again if \$8 billion in uranium enrichment guarantees were carried on budget.

It is not clear that to make that kind of addition represent any kind of a realistic policy option, since you would necessarily not do all those things and would not incur all those costs at the highest level of the range we predict.

On the off budget impacts, of course, you could start with three-quarters of a billion dollars of loan guarantees for the coal provisions of the Energy Policy and Conservation Act and go up to \$100 billion for the Energy Independence Authority.

Those are off budget.

NUCLEAR R. & D. EXPENDITURES

Senator Moss. I asked a question earlier about the percentage of nonnuclear as against the nuclear R. & D. expenditure proposed for 1977. You said that the dollar amounts had gone up but as a percentage the nonnuclear R. & D. were reduced.

Does this indicate a conscious decision by the administration shift toward more nuclear?

One of the reasons ERDA was established was to try to spread our efforts more equitably across the R. & D. board. Does this represent a sliding back?

Mr. COSTLE. It is hard to say, Senator, because of all the programs they have, the ones that are most mature, that is, the ones which have had the most time and effort invested in the past, are the nuclear programs.

So their readiness to proceed with the next major increment in the nuclear field is probably better than it is in the fossil, or nonnuclear area.

As I think Dr. Dowd indicated, the Agency did not get from the President what it requested for nonnuclear; but that is not unusual, either.

Few agencies in this town ever get what they request. But, it does suggest that there are areas where the agency feels it would be ready to proceed this year and which OMB has decided not to allow them to pursue.

SOLAR AND GEOTHERMAL EXPERIMENTS

In truth, I think there is a full range of opinion. I think you could find proponents at all ends of the spectrum on how ready we are to proceed with certain solar experiments, geothermal experiments; whether we are pushing the fusion development at the fastest pace we possibly can, for example. The judgments are harder to make because they are less mature technologies; there has been less time and money spent on them to bring them along to the level of maturity which the nuclear program enjoys.

ERDA is still trying to become ERDA. The largest piece they inherited was the AEC, and they have had to scramble over the last 2 years. I am reminded of the phrase that Bill Ruckelshaus used to describe the first 2 years of the Environmental Protection Agency's existence. Like ERDA, EPA began with a mixed inheritance of programs, some more mature than others. Ruckelshaus likened trying to organize that Agency to trying to perform an appendectomy while running the 100-yard dash.

So, I think we need to take a closer look at the budget justifications that we now are receiving, and CBO will be in a position, I think, to assist the Congress in its evaluation.

COMPARISON OF OFF- AND ON-BUDGET FINANCING

Senator Moss. What are the pros and cons of off-budget and on-budget financing? Is there any difference in the two on the capital markets?

Mr. COSTLE. I would like to ask Ed Rastatter, who is here from our staff, to address that question. Mr. Rastatter came to CBO from OMB, where, among many things, he was specifically concerned with questions of off-budget agencies and financing.

Senator Moss. Very good. Ed?

Mr. RASTATTER. I think you have to start at a fairly basic level on that question, and that is, what is the difference between a budget and off-budget expenditure?

We count on-budget expenditures in the unified budget, but we don't count off-budget expenditures. That is literally the only difference.

Agencies become off-budget agencies in one of two ways: First of all, the Congress can elect to define them that way by statute, as is done occasionally, for example, the Federal Financing Bank. In other cases, they were initially established as on-budget agencies, with an infusion of Federal "seed money," but once the initial public investment in the agency is paid off, then the agency becomes defined as an off-budget agency. That was done in the case of banks for cooperatives, among others.

That is literally the only difference. The agency has to get its money in some way. Both types borrow in the capital markets, as is done with the Farm Credit Administration agencies—off budget—and TVA—on budget—and both types also borrow from the Treasury, in this case Farmers Home—on budget—and Rural Telephone Bank—off budget. We imperfectly understand the differential effects of these types of borrowing on the capital markets themselves. There may be none at all.

It is simply classified differently, either government borrowing or government-assisted borrowing.

So, it is very difficult to say what its effect is on the capital markets. There is not that much substantive difference between an on-budget or off-budget agency.

Senator Moss. Did you have a followup question?

IMPACT ON CAPITAL MARKETS

Mr. TWOMEY. Is it your understanding that the impact on the capital market of a \$5 billion or \$10 billion program whether financed off budget or under a Federal guarantee, the effect is essentially the same on the capital market, with possibly a minor interest rate differential?

Mr. RASTATTER. I have not addressed the question of loan guarantees yet. I have discussed whether the agency doing the spending is on budget or off budget.

What you now are asking is a secondary part of that, and that is whether a program is really financed by loan guarantees or direct loans.

In the past, loan guarantees were typically not counted anywhere.

Now, however, with the creation of the Federal Financing Bank, late in 1973, most new substantial loan guarantee programs are being financed through the Federal Financing Bank, which is, you might say, a back door to the U.S. Treasury.

So, there is literally no difference in the capital markets whether a program is financed through loan guarantees or direct loans.

Senator Moss. Thank you.

FUNCTION ACCOUNTING PRACTICES

Your figures on subfunction 305 for energy differ from those of the President in his fiscal 1977 budget.

Would you clarify the administration's number? Are the numbers realistic?

Mr. TIMENES. Mr. Chairman, I think they are not boobytraps. They are attempts to further define the accounting practices for the functions, and to assist in understanding and grouping the programs correctly.

For example, the change of the laser fusion program from the national security account to the energy account is a transfer which makes a great deal of sense.

The laser fusion technology was first developed in the national security directorate of AEC, and ended up in their budget largely for organizational reasons.

It is, of course, useful for weapons purposes, but it is basically now being considered as a fusion technology, and appropriately as an energy technology.

We have some other changes there. Bill, was there anything else in that direction?

Mr. HEDERMAN. One other aspect of the functional shift is that, in the past, the program direction was allocated among the national security, general science, and energy functions. At this time ERDA has decided to classify all of the general program direction effort as subfunction 305. This shift results in an addition of approximately \$100

million in ERDA's subfunction 305 activity. That is the other major shift.

Mr. TWOMEY. Is there any significant shift of the allocation of costs in ERDA between function 300 and function 050?

Mr. TIMENES. I haven't looked at 050, I am afraid.

Mr. TWOMEY. There is a nuclear component in 050: National defense.

Mr. TIMENES. Two pieces would have come out of that.

Mr. TWOMEY. Could you, for the record, provide an analysis of that as to how the allocations of costs may have changed between the fiscal year 1976 budget when first presented and the current version of the 1976 budget?

Mr. TIMENES. Yes.

[The following was subsequently supplied for the record:]

ERDA BUDGET CHANGES DUE TO INTERNAL FUNCTION SHIFTS FROM NATIONAL SECURITY (053) TO ENERGY (305)

[In millions of dollars]

	Fiscal year—	
	1976 budget authority	1976 outlays
Program direction.....	80	78
Laser fusion.....	84	60
Nuclear material security.....	17	18
Security investigations.....	12	12
Other (primarily plant).....	69	10
Total.....	262	152

URANIUM ENRICHMENT—PRIVATE VS. PUBLIC

Senator Moss. What concrete benefits might accrue from turning uranium enrichment over to private industry?

Would it free up any Federal financial resources? How would it affect our safety control? What about future profits?

Mr. COSTLE. If you look at the revenue patterns and cost and cash-flow patterns of the alternatives over a sufficient length of time, there is a wash; however, if the Government were to build that next increment of capacity, outlays would increase very significantly, starting and running through the mid to late 1980s. Revenues would eventually overtake those outlays, and there is a crossover point at which revenues would be exceeding outlays. Then further down the road there would be sufficient cumulative revenues to completely amortize the cost of the facilities. From there on out, to the extent that the facilities would continue to operate, and I think that dates from 1994, substantial net revenues would accrue to the Government. Obviously, what happens after 1994 is somewhat speculative, because among other things, we don't know how many nuclear powerplants will require a supply of enriched uranium at that time. The figure of \$3 billion in net revenues, all costs having been offset by that time, would be straight revenues for the Federal Government, however.

CAPITAL FROM FOREIGN SOURCES

Mr. Dowd. There is one potential advantage, which is in the private case, the argument made by the President is that the private sector

would go to foreign sources for some of the capital, and in the case of the one proposal that we know about, the diffusion plant proposed by Uranium Enrichment Associates, they propose to have 60 percent of the funding come from foreign sources.

That would reduce domestic funding by \$1.2 billion.

On the other hand, the total funding in that proposal is not just the funding of the enrichment plant, but also the funding of the powerplants that are necessary to fuel it, and that raises the total cost of capital for the fusion plants plus its powerplants to something on the order of \$5 billion.

So, it is a smaller percentage reduction, but it is a potential reduction in capital required. That would be an advantage, but it is not an enormously big shift.

OUTER CONTINENTAL SHELF RECEIPTS

Mr. McQUILLEN. OCS receipts is an estimate, which means that we have made a full projection of the bonuses, the acreage, and the slip-page as we go from one fiscal year to the other. As to the difference between the \$6 billion we have seen in the OMB budget and your current figure, Interior has been pretty good on estimating the royalties, and the leases that we are dealing with this year come early enough in the fiscal year so that slippage is not really a potential problem, as it was last year.

That leaves us with acreage.

Isn't the difference between OMB's estimate and your current estimate pretty much confined to a difference of opinion on the acreage?

OCS—POTENTIAL SALES

Mr. OPPENHEIMER. No; there is a good deal of agreement between their estimates and mine about how much acreage will be put out.

Now, there is some possibility that they may change their schedule of future sales. They would like to sell in the Beaufort Sea rather than near Kodiak Island. Therefore, the schedule I have shown you on page 28 [see p. 53] is different from their original leasing schedule. The big difference in numbers between their \$6 billion and our \$2.8 to \$4.2 billion is revenue per sale.

We do our calculations in a very similar fashion, but if you change assumptions, the estimates are extremely sensitive to those differences, more sensitive even than these tables show.

So, we are dealing with an extremely uncertain forecast here, and the ranges I have don't show all those uncertainties. Any given sale could be twice as large as I predict, or twice as small.

Mr. COSTLE. As you recall, this was essentially the experience with the California sale. It came in, I think—let me see if I can recall the actual figures—Interior was predicting \$1.8, and they got roughly \$400 million. Moreover, bidding in the frontier areas is, I'm told, very difficult for the oil companies because they don't really know what is out there. Prebid estimates are going to continue to have a large element of speculativeness about them—particularly in frontier areas.

Mr. OPPENHEIMER. And it varies between the companies; they don't know the answers either.

Mr. McQUILLEN. The things we used to deal with like slippage and so forth are minor elements.

Mr. OPPENHEIMER. Yes.

CONSERVATION PROGRAM

Mr. ASHLEY. Referring to conservation, you gave a figure which indicated an increased effort in conservation R. & D. in the ERDA budget. Apart from that, what does the conservation program look like? Is there a dollar figure identified under conservation?

Mr. COSTLE. Some of that is very difficult to put a dollar cost on because it does not directly involve the Federal budget; for example, the mandatory fuel economy standard for the auto industry. There is testimony on the record now from the auto companies as to what it will cost to meet those standards, and if you recall, there were adjustments made in the timetables for compliance before that bill cleared. That is a part of the conservation effort called for by the bill. Many other conservation measures were asked of industry in that bill in an essentially advisory manner only.

Congress did direct ERDA, however, to research and to fund demonstrations on how energy can be conserved or more efficiently used. A potential weakness, however, is that there is not clear provision made for ensuring the transfer of the knowledge gained from that research to the marketplace—or rather, to ensure that the marketplace will adopt the knowledge gained.

There seem to be some practical alternatives that can be demonstrated by ERDA and hopefully markets will pick them up based on the detailed cost data that will come out of the ERDA demonstrations.

ERDA is reasonably optimistic about what can be done.

In other areas, you have things ranging from one extreme, the rules that the Federal Government applies to the use of its own facilities in terms of conserving energy.

That is hard to get a fix on.

NEW CONSERVATION TECHNOLOGIES

Specifically in the budget, probably the most helpful thing to look at is what ERDA is going to be spending to develop new conservation technologies, and I think one of the areas that Congress should have a particular interest in, is what ERDA plans to do to transfer those to commercial application.

Mr. Down. May I respond briefly?

In the briefing book section for energy R. & D. [see p. 65] we have several pages and we have done a program-by-program description including conservation, research and development, and I just note it here that because the conservation research and development is at the moment made up of so many relatively small pieces that a reduction of the budget really is a reduction of the level of effort.

It is not as if as of the moment you are putting off one or two major items. You are putting off a whole lot of things, most of which are relatively small demonstrations designed to convince the building industry or people who have to do with building codes that these new ways make sense, because many local jurisdictions are very hesitant to

allow new methods of insulation or a new percentage of window areas, or reduce the lighting standards.

All would have an effect on conservation. They won't do it unless someone shows the way, and a good bit of the money is designed for that kind of project.

If you reduce the money, you reduce the scope of the project. You don't reduce any single big item.

LOAN GUARANTEE PROGRAM

Mr. COSTLE. Significant to the markup on the first concurrent resolution, there are several Members of Congress who are planning to introduce a bill which would set up a loan guarantee program specifically in the conservation area—that is, loan guarantees to encourage businesses to make investments in energy-saving techniques. We don't know much about the specifics of that bill, but we are told it will be coming up this year, and that should probably show up in the reports that you expect to receive shortly.

I think the level of effort there was something on the level of \$600 million. Again, that raises a question about do you score that BA, and if so, do you do it all at once, or spread it out, and are loan guarantees on or off the budget?

There is no formula answer for this, but I think it involves a policy judgment of the Congress as to how this ought to be treated.

Senator Moss. Let me thank you for this fine presentation today.

This seminar has clarified a number of points and will be useful to us in developing the first concurrent budget resolution. All of us are very appreciative of the CBO effort represented here today.

Mr. COSTLE. Thank you, Senator.

Senator Moss. Thank you very much.

[Whereupon, at 3:15 p.m., the committee recessed to reconvene subject to the call of the Chair.]

BRIEFING BOOK
for
ENERGY TASK FORCE
COMMITTEE on the BUDGET
U. S. SENATE

Natural Resources and Commerce
Division
Congressional Budget Office

March 12, 1976

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FUNCTION 300

SECOND CONCURRENT RESOLUTION

FY76

	BA	OUT
301 Water	12.6	4.0
302/3 Land & Recreation	2.1	2.1
304 Environment	0.6	2.8
305 Energy	3.2	2.4
306 Other Resources	0.6	0.7
Offsets & New Legislation	-0.4	-0.6
TOTAL	18.7	11.4

FUNCTION 305

SECOND CONCURRENT RESOLUTION FOR FY 1976

	<u>BA</u>	<u>OUTLAYS</u>
GENERAL OPERATING PROGRAMS	0.5	0.5
REGULATION	0.2	0.2
RESEARCH AND DEVELOPMENT	2.5	1.7
	<u> </u>	<u> </u>
TOTAL	3.2	2.4

President's National Energy Program

FY 1977 Budget

Program Activities	(outlays in millions of dollars)				
	FY 1976		FY 1977		percent change
	\$	%	\$	%	
Domestic Energy Resource Development, Conservation Petroleum Storage (e.g., FEA, Energy Independence Authority, TVA and Power Administrations, Uranium Enrichment)	5,516	69.4	7,259	70.0	31.6
Energy Research, Development, and Demonstration (e.g., ERDA, Interior , NRC)	2,194	27.6	2,858	27.6	30.3
Regulation (FEA, FPC, MESA, NRC)	234	3.0	244	2.4	4.3
TOTAL OUTLAYS	7,944	100.0	10,361	100.0	30.4
Less: Receipts (TVA, NPR, Uranium Enrichment)	-3,385		-4,355		28.7
Net Outlays	4,559		6,006		31.7

*Does not include Budget Requests for Implementation of EPCA

PRESIDENT'S FY 1977 PROPOSALS FOR FUNCTION 305
(BILLIONS)

	<u>BA</u>	<u>OUTLAYS</u>
GENERAL OPERATING PROGRAMS	0.7	0.5
REGULATION	0.2	0.2
RESEARCH AND DEVELOPMENT	3.1	2.7
ENERGY INDEPENDENCE AUTHORITY	*	*
	<hr/>	<hr/>
	4.0	3.4

* Less than \$50 million.

SPECIFIC ISSUES:

- ENERGY RESEARCH AND DEVELOPMENT
- ENERGY POLICY AND CONSERVATION ACT
 - PETROLEUM STORAGE
 - NAVAL PETROLEUM RESERVES
 - OTHER
- URANIUM ENRICHMENT
- SYNTHETIC FUELS
- ENERGY FINANCING
 - ENERGY INDEPENDENCE AUTHORITY
 - TAX EXPENDITURES
- OCS RECEIPTS

ISSUE: R&D FUNDING

- WHAT SHOULD BE THE LEVEL OF FUNDING FOR ENERGY R&D?
- TO WHAT EXTENT SHOULD THE GOVERNMENT SUPPORT LARGE-SCALE DEMONSTRATIONS?
- HOW SHOULD R&D FUNDS BE DISTRIBUTED AMONG COMPETING TECHNOLOGIES?

ISSUE: R&D FUNDING
(BILLIONS)

	<u>BUDGET AUTHORITY</u>	<u>OUTLAYS</u>
● FY '76 SECOND CONCURRENT RESOLUTION	2.5	1.7
PRESIDENT'S BUDGET	2.4	2.1
● FY '77 CURRENT POLICY BUDGET	2.7	2.4
PRESIDENT'S BUDGET	3.1	2.7
● POTENTIAL ADDITIONS		
ON BUDGET	0.5-1.1	0.4-0.7
OFF BUDGET	--	--

PRESIDENT'S FY 1977 PROPOSALS FOR R&D

BUDGET AUTHORITY-MILLIONS

FOSSIL ENERGY	\$477
SOLAR ENERGY	160
GEOTHERMAL ENERGY	50
CONSERVATION	120
SUBTOTAL, NONNUCLEAR	(807)
FUSION POWER	392
NUCLEAR FUEL CYCLE	179
FISSION REACTOR	790
URANIUM ENRICHMENT	140
SUBTOTAL, NUCLEAR	(1,501)
OTHER AGENCIES	291
SUPPORTING TECHNOLOGIES	515
TOTAL, R&D	3,114

ISSUE: FULL FUNDING FOR
ENERGY POLICY AND CONSERVATION ACT

- NO PROVISION IN SECOND CONCURRENT RESOLUTION
OR PRESIDENT'S ~~B~~BUDGET.
- REGULATION
- CONSERVATION
- DEVELOPMENT

ISSUE: ENERGY POLICY AND CONSERVATION ACT
(BILLIONS)

	<u>BUDGET AUTHORITY</u>	<u>OUTLAYS</u>
● FY '76 SECOND CONCURRENT RESOLUTION	NOT	INCLUDED
PRESIDENT'S BUDGET	NOT	INCLUDED
● FY '77 CURRENT POLICY BUDGET	NOT	INCLUDED
PRESIDENT'S BUDGET	NOT	INCLUDED
● POTENTIAL ADDITIONS		
ON BUDGET FY '76	0.2-0.4	0.1
FY '77	0.4-1.2	0.35-0.85
OFF BUDGET FY '77	0.75	

IMPLEMENTATION OF ENERGY POLICY & CONSERVATION ACTMAXIMUM POTENTIAL ADDITION

	FY '76		FY '77	
	<u>BUDGET AUTHORITY</u>	<u>OUTLAYS</u>	<u>BUDGET AUTHORITY</u>	<u>OUTLAYS</u>
● REGULATION	-	-	0.05	0.05
● CONSERVATION	0.05	-	0.1	0.1
● DEVELOPMENT				
STORAGE	0.1-0.3	0.1-0.2	0.2-1.0	0.1-0.7
NPR (HR 49)	0.1	*	*	0.1
● TOTAL ON BUDGET	0.2-0.4	0.1	0.4-1.2	0.3-0.9
INCENTIVES FOR COAL (OFF BUDGET)			0.75	-
TOTAL MAXIMUM ADDITIONS:	0.2-0.4	0.1-0.2	1.1-1.9	0.3-0.9
● RECEIPTS FROM NPR SALES				0.5

* LESS THAN \$50 MILLION

ISSUE: URANIUM ENRICHMENT

- SHOULD THE FEDERAL GOVERNMENT

CONTINUE TO OWN AND MANAGE ALL U.S.

ENRICHMENT, AS IT DOES NOW, OR

SHOULD FUTURE ADDITIONS TO CAPACITY

BECOME THE RESPONSIBILITY OF THE

PRIVATE SECTOR?

ISSUE: URANIUM ENRICHMENT
 (BILLIONS)

BUDGET
AUTHORITY

OUTLAYS

● FY '76 SECOND CONCURRENT RESOLUTION	*	*
PRESIDENT'S BUDGET	1.0	1.0

● FY '77 CURRENT POLICY BUDGET	*	*
PRESIDENT'S BUDGET	1.5	1.3

● POTENTIAL ADDITIONS		
ON BUDGET	.4	.1
OFF BUDGET	.0 - 8.0	-

* NOT ESTIMATED

NOTE: OFFSETTING RECEIPTS NOT SHOWN

ISSUE: FINANCING ENERGY DEVELOPMENT

- TO WHAT EXTENT SHOULD THE FEDERAL

GOVERNMENT ASSIST IN FINANCING ENERGY

DEVELOPMENT?

- SYNFUELS
- EIA
- ELECTRIC UTILITIES

ISSUE: SYNTHETIC FUELS COMMERCIALIZATION

SHOULD THE GOVERNMENT PROVIDE FINANCIAL GUARANTEES
TO STIMULATE PRIVATE INVESTMENT IN PRODUCING OIL AND
GAS FROM COAL, OIL SHALE, AND URBAN WASTE?

ISSUE: SYNTHETIC FUEL COMMERCIALIZATION
(BILLIONS)

	<u>BUDGET AUTHORITY</u>	<u>OUTLAYS</u>
● FY '76 SECOND CONCURRENT RESOLUTION	--	--
PRESIDENT'S BUDGET	.5	*
● FY '77 CURRENT POLICY BUDGET	--	--
PRESIDENT'S BUDGET	--	--
● POTENTIAL ADDITIONS		
ON BUDGET	up to 2.0	*
OR		
OFF BUDGET	up to 3.1	*

* Less than 50 million.

ISSUE: ENERGY INDEPENDENCE AUTHORITY

SHOULD AN OFF-BUDGET ENERGY INDEPENDENCE AUTHORITY
TO PROVIDE FINANCIAL ASSISTANCE TO PRIVATE ENERGY
INVESTMENT BE CREATED?

ISSUE: ENERGY INDEPENDENCE AUTHORITY
(BILLIONS)

BUDGET
AUTHORITY

OUTLAYS

● FY '76 SECOND CONCURRENT RESOLUTION PRESIDENT'S BUDGET	- -	- -
● FY '77 CURRENT POLICY BUDGET PRESIDENT'S BUDGET	- - .04	- .04
● POTENTIAL ADDITIONS ON BUDGET OFF BUDGET	- 83	- .65

ISSUE: TAX EXPENDITURES

SHOULD TAX INCENTIVES BE PROVIDED TO ENCOURAGE
ELECTRIC UTILITY INVESTMENT?

ISSUE: PROPOSED ELECTRIC UTILITY TAX CUTS

	1977	1980
--	------	------

PRESIDENT'S BUDGET

CORPORATE	0 .4	
-----------	------	--

INDIVIDUAL	0 .4	
------------	------	--

TOTAL	0 .8	
-------	------	--

TREASURY ESTIMATE OF

LONG-TERM IMPACT		2.0
------------------	--	-----

ISSUE: OCS RECEIPTS

(SUBFUNCTION 953)

- WHAT ESTIMATES OF OCS RECEIPTS

SHOULD BE PROVIDED FOR THE

FIRST CONCURRENT RESOLUTION?

ISSUE: OCS RECEIPTSFY 1976RECEIPTS

PRESIDENT'S BUDGET

8.0

SECOND CONCURRENT RESOLUTION

4.5

CURRENT CBO ESTIMATE

2.2 to 2.8

FY 1977

PRESIDENT'S BUDGET

6.0

CURRENT CBO ESTIMATE

2.8 to 4.2

FY 1976 STATUS\$ BILLIONRECEIPTS IN HAND

PAST LEASE SALES	0.8
------------------	-----

ROYALTIES	0.6
-----------	-----

POTENTIAL FUTURE RECEIPTS

RELEASE OF ESCROW	0.8
-------------------	-----

SALE IN GULF OF ALASKA	0.0 to 0.6
------------------------	------------

TOTAL	2.2 to 2.8
-------	------------

FY 1977 PROJECTION\$ BILLIONLEASE SALE RECEIPTS

NORTH ATLANTIC 0.9 - 1.2

SOUTH ATLANTIC 0.2 - 0.4

GULF OF MEXICO (Two Sales) 0.2 - 0.4

COOK INLET (ALASKA) 0.4 - 0.6

BEAUFORT SEA (ALASKA) 0.5 - 1.0

SUB-TOTAL 2.2 to 3.5

ROYALTIES

0.6

TOTAL 2.8 to 4.2

Sales scheduled for FY 1977, but likely to be postponed:

KODIAK ISLAND (ALASKA)

BERING SEA (ALASKA)

RESEARCH AND DEVELOPMENT

TABLE

THE PRESIDENT'S BUDGET FOR ENERGY R&D
PART I - BUDGET AUTHORITY
(Millions)

	Outlays Comparison					
Programs	FY 1976	TQ	FY 1977	FY 1977 as % total	FY 1977- FY 76	FY 77-FY 76 FY 76
Direct Energy Technologies:						
A. Fossil Energy	398	105	477	15.3%	+ 79	+ 19.8%
B. Solar Energy	115	34	160	5.1%	+ 45	+ 39.1%
C. Geothermal Energy	31	12	50	1.6%	+ 19	+ 61.3%
D. Conservation R&D	75	17	120	3.9%	+ 45	+ 60.0%
Subtotal	(619)	(168)	(807)			
E. Fusion Power	250	80	392	12.6%	+142	+ 56.8%
F. NUC Fuel Cycle	69	21	179	5.7%	+110	+159.4%
G. Fission Reactor	602	137	790	25.4%	+188	+ 31.2%
H. Uranium Enrichment (R&D related only)	87	25	140	4.5%	+ 53	+ 60.9%
Subtotal	(1,003)	(263)	(1,501)			
I. Other Agencies	297	*	291	9.3%	- 6	- 2.0%
Total Direct	1,924	*	2,599			
Supporting Technologies:	441	113	515	16.5%	+ 74	+ 16.8%
Grand Total Energy R&D:	2,365	*	3,114	100%	+749	+ 31.7%

Operating plus plant and capital equipment.

* Not estimated.

TABLE

THE PRESIDENT'S BUDGET FOR ENERGY R&D
PART 2 - OUTLAYS
(Millions)

Programs	Outlays Comparison					
	FY 1976	TQ	FY 1977	FY 1977 as % total	FY 1977- FY 76	FY 77-FY 76 FY 76
Direct Energy Technologies:						
A. Fossil Energy	333	64	442	16.5%	+109	+ 32.7%
B. Solar Energy	86	26	116	4.3%	+ 30	+ 34.9%
C. Geothermal Energy	32	9	46	1.7%	+ 14	+ 43.8%
D. Conservation R&D	56	14	91	3.4%	+ 35	+ 62.5%
Subtotal	(507)	(113)	(695)			
E. Fusion Power	224	65	304	11.4%	+ 80	+ 35.7%
F. NUC Fuel Cycle	59	18	147	5.5%	+ 88	+149.2%
G. Fission Reactor	522	160	684	25.6%	+162	+ 31.0%
H. Uranium Enrichment (R&D related only)	89	22	108	4.0%	+ 19	+ 21.3%
Subtotal	(804)	(265)	(1,243)			
I. Other Agencies	247	*	264	9.9%	+ 17	+ 6.9%
Total Direct	1,648	*	2,202			
Supporting Technologies:	407	109	475	17.7%	+ 68	+ 16.7%
Grand Total Energy R&D:	2,055	*	2,677	100%	+662	+ 30.3%

Operating plus plant and capital equipment.

* Not estimated.

COMPARISON OF DIVISION, ERDA, AND OMB REQUESTS/PRIORITIES
(BUDGET AUTHORITY FOR FY '77)

	DIVISION REQUEST		ERDA REQUEST		OMB REQUEST	
	FUNDS	PROGRAM EMPHASIS	FUNDS	PROGRAM EMPHASIS	FUNDS	REDUCTION OMB/ERDA
	\$ M	Percent	\$ M	Percent	\$ M	Percent
A. Fossil Energy	794	20.7	699	20.4	477	68
B. Solar Energy	367	9.6	276	8.0	160	58
C. Geothermal	102	2.7	90	2.6	50	56
D. Conservation	262	6.8	243	7.2	120	49
Subtotal						
Direct Non-nuclear	1,525	39.8	1,308	38.2	807	62
E. Fusion Power	685	17.9	624	18.2	392	63
F. Fuel Cycle	336	8.8	326	9.8	179	53
G. Fission	1,063	27.7	941	27.5	790	84
H. Enrichment	223	5.8	214	6.3	140	65
Subtotal						
Direct Nuclear	2,307	60.2	2,115	61.8	1,501	71
Subtotal, ERDA	3,832	100	3,423	100	2,308	67
I. Other Agencies	*		*		291	
Direct R&D						
Supporting Technologies	851		697		515	
Total, R&D	*		*		3,114	

Source: See Chapter VI.

* Not reported.

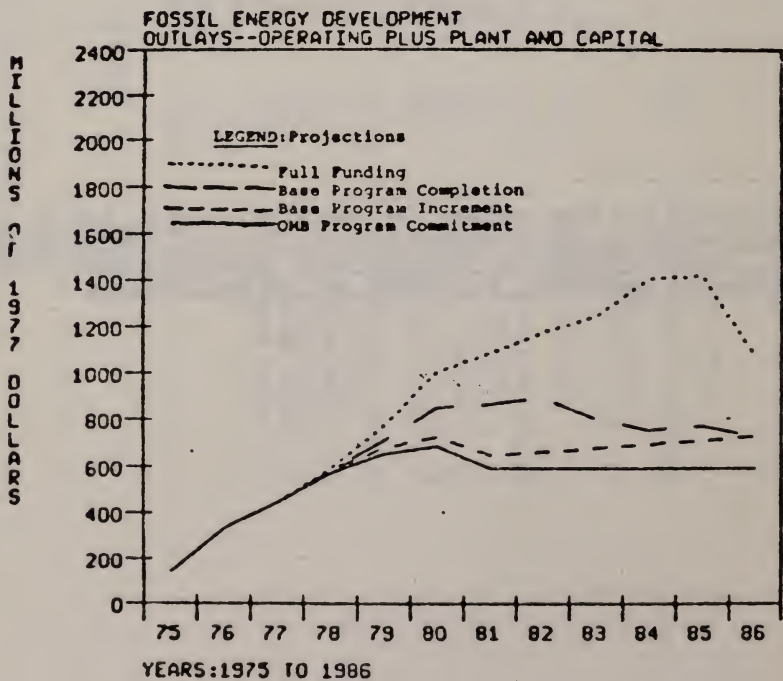
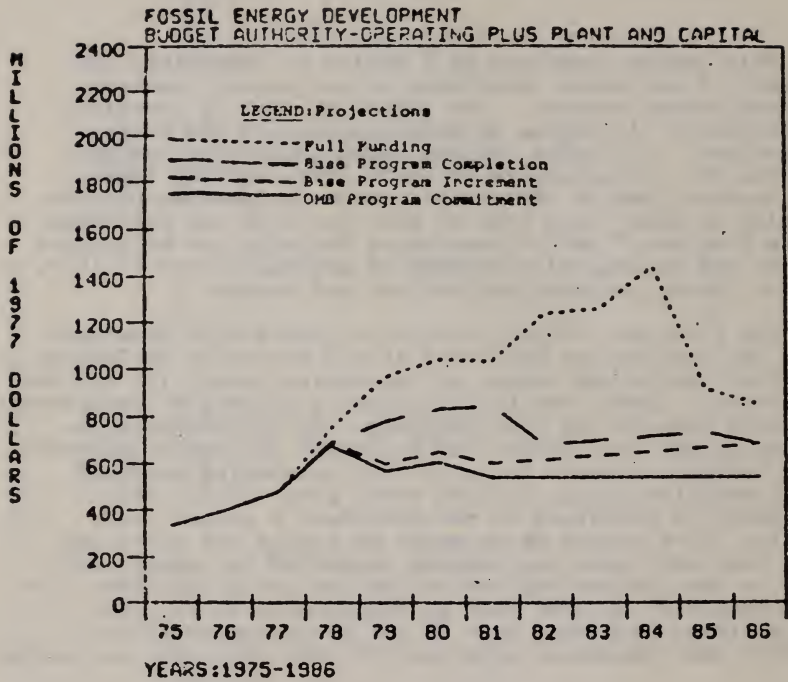
VI. THE FISCAL YEAR 1977 BUDGET BY PROGRAM

This chapter consists of a series of summaries, one for each of the major components of the energy research and development program. The format of each is identical, consisting of (1) graphs of budget authority and outlay projections, (2) tables showing budget authority and outlays for the components in FY 1975, 1976, and the transition quarter, and FY 1977 budget requests from the program division to ERDA, from ERDA to OMB, and from the President to the Congress,* AND (3) narrative descriptions of program content and trends, (4) initiatives and issues for FY 1977, and (5) future program implications and trends.

The five-year budget projection charts were developed using the methodology described at the beginning of Chapter IV. Four levels are shown, in increasing order: (1) the OMB projections, taken from the President's budget, of commitments resulting from his FY 1977 requests, (2) an increment to provide modest real growth (3% per year) for mature programs and a larger increment to fully fund developing programs, (3) in addition, fully funding those programs for which seed money is contained in the President's budget, and, finally, (4) a budget which would do all of the above and fully fund all those initiatives suggested for subsequent years in the program implementation portion of the ERDA plan. It is important to note that no commitments to the full funding level have been made or are being suggested for FY 1977; they represent potential FY 1978 and later decisions.

* Division and ERDA request are contained in U.S. Energy Research and Development Administration, "FY 1977 Budget History Tables, Comparing Division Requests with Requests Submitted to the Office of Management and Budget and to the Congress."

A. FOSSIL ENERGY DEVELOPMENT



FY 1977 Request

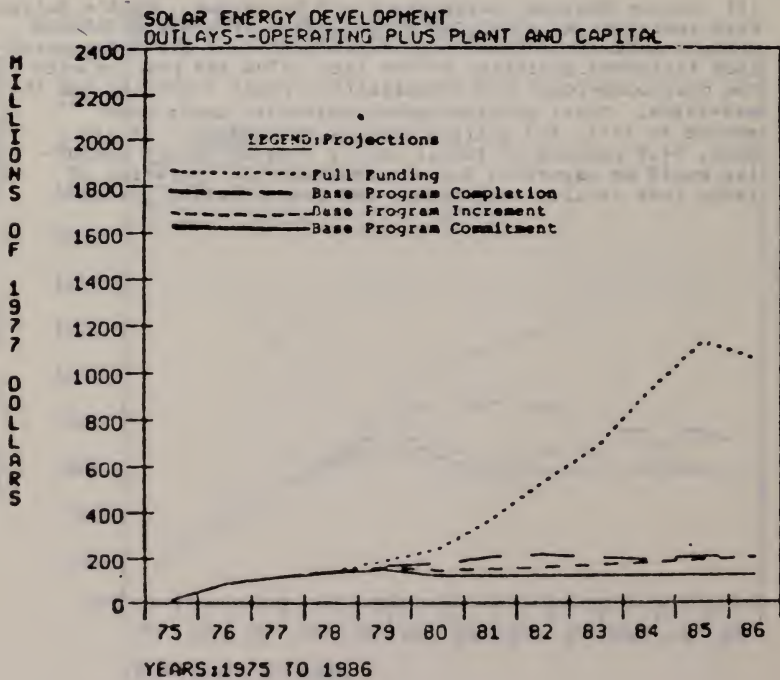
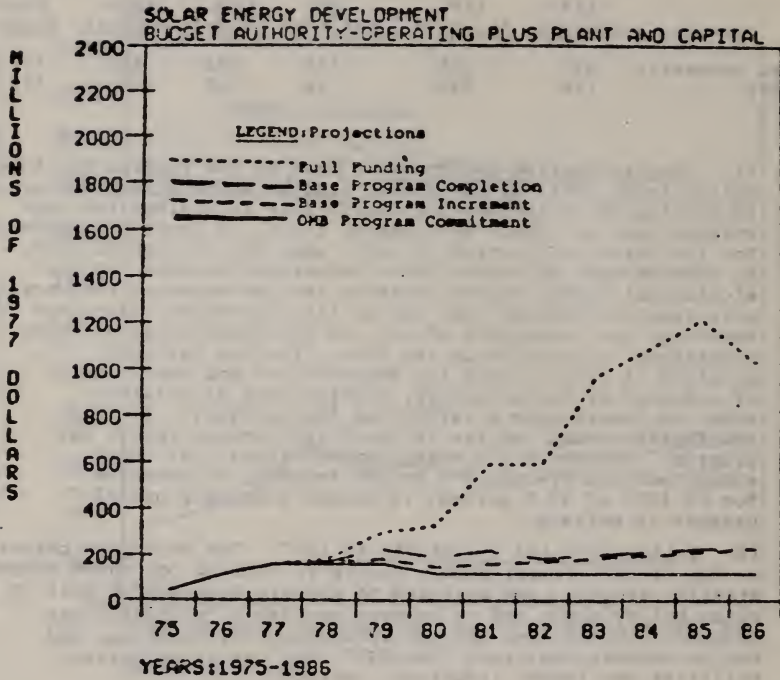
	<u>1975 Actual</u>	<u>1976 Estimate</u>	<u>TQ Estimate</u>	<u>Div. Request</u>	<u>ERDA Request</u>	<u>Pres. Budget</u>
Budget Authority	335	398	105	794	699	477
Outlays	138	333	64	755	660	442

(1) Program Content and Trends. Most of the funding for fossil energy (some 85%) is for a coal program whose objectives are: to develop an environmentally acceptable technology for converting coal to liquid and gaseous fuels, to improve methods for the direct combustion of coal, and, for the longer term, to advance more efficient power conversion systems. Other significant fossil energy programs include enhanced recovery of petroleum and natural gas, and in situ technology (in-place retorting and production of oil and gas without earth-moving operations) for oil shale and coal. Funding has been provided in recent years for construction and operation of a number of "pilot plants, costing tens of millions each, to investigate a variety of technologies. Overall, the fossil energy program is the third largest energy R&D program. Growth in the fossil energy budget has been steady and the President's budget requests an increase for FY 1977 of 19.8 percent in budget authority and 32.7 percent in outlays.

(2) Initiatives and Issues for FY 1977. The major new thrust in the FY 1977 fossil energy budget is funding for three demonstration plants: one designed to convert high-sulfur coal to a clean boiler fuel, one to convert coal to a "high-BTU" gas or quality sufficient to justify shipment by pipeline, and one to convert coal to a "low-BTU" fuel gas for electric utilities and longer industrial users.

(3) Future Program Implications and Decisions. ERDA's Nation Plan envisions an ambitious construction program, beginning with further large scale pilots for synthetic oil and pressurized fluid-bed gasifiers in the late 1970s and peaking with the near-commercial MHD demonstration plant scheduled for the mid-1980s. Total program budget authority could peak around FY 1984, and outlays shortly thereafter. At its peak, 54.9 percent of fossil energy program budget authority would be earmarked for construction and operation of large test facilities, pilots, and demonstration plants.

B. SOLAR ENERGY DEVELOPMENT



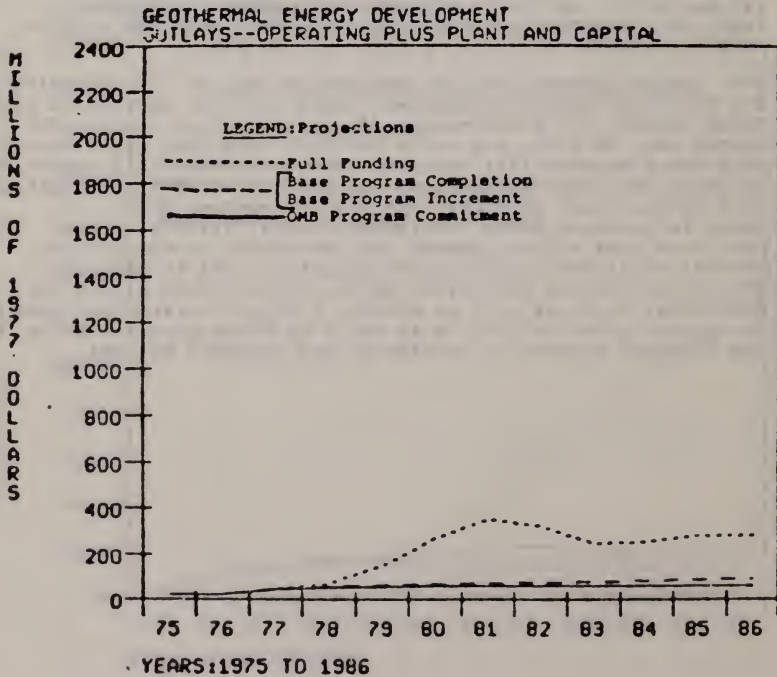
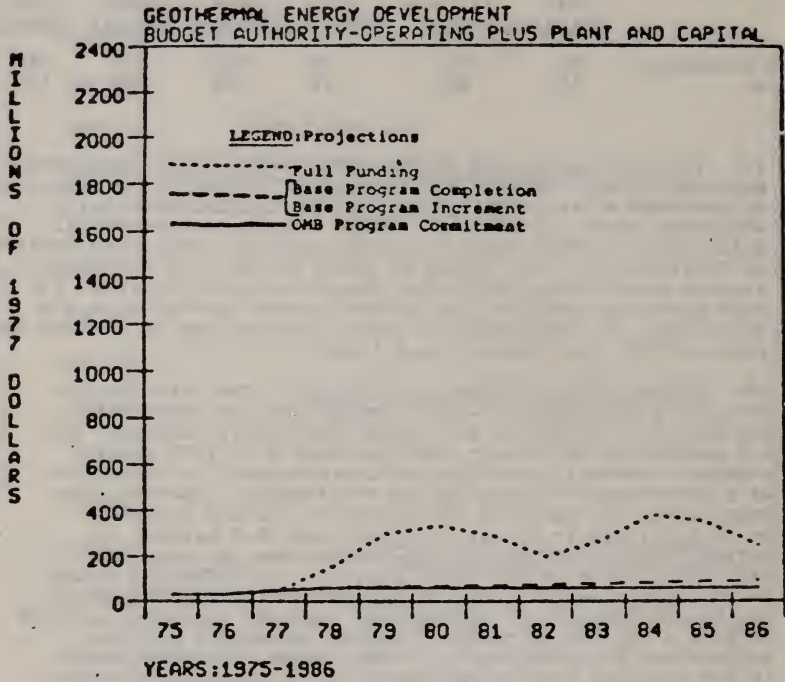
	1975 Actual	1976 Estimate	TQ Estimate	FY 1977 Request		
				Div. Request	ERDA Request	Pres. Budget
Budget Authority	42	115	34	367	276	160
Outlays	15	86	26	253	219	116

(1) Program Content and Trends. The solar energy development program contains diverse subprograms to determine the viability of proposed solar technologies, and to tap the essentially unlimited energy of the sun. These subprograms include (1) using solar thermal energy directly for the heating and cooling of buildings, (2) conversion of solar energy into electricity through photovoltaic and solar thermal electric systems, (3) wind power systems, (4) use of the thermal gradients in the ocean, and (5) conversion of organic matter such as garbage and plant matter into useful clean fuels.

(2) Initiatives and Issues for FY 1977. The solar energy program is relatively new but growing rapidly, accounting for only 5.1 percent of all energy R&D budget authority and 4.3 percent of outlays in the President's FY 1977 budget request. Overall, this program ranks seventh in importance as a percentage of total energy R&D funding. However, program growth is beginning to accelerate, having increased by 39.1 percent in budget authority and 34.9 percent in outlays over the FY 1976 level. There are, as yet, few big-ticket items in the solar program. Accordingly, debate on the appropriate funding level must center on assessments of the availability of appropriate research opportunities and on ERDA's ability to manage a rapidly expanding program. Differences in perception of these issues may be reflected in the ratio of funding requested in the President's budget to that originally recommended by the responsible division (44 percent), the lowest of any major program. Nevertheless, even the President's budget request represents a four-fold increase in the solar program in two years.

(3) Future Program Implications and Decisions. Full funding for the solar energy development would move the program up to fifth largest (as a percentage of total budget authority for energy R&D) in 1981, and third by 1984. The most rapid growth will occur between 1981 and 1985 when construction is scheduled to begin for large-scale pilot and demonstration plants testing such technologies as multi-unit wind complexes, off-shore ocean temperature power generation barges, silicon arrays and large area silicon sheets for conversion to electricity, central receivers, distributed collectors, and terrestrial and marine biomass conversion units. Since these pilots and demonstration units will be costly, a major decision may have to be made prior to 1981 as to which of these programs holds the greatest promise of commercial and economic success.

C. GEOTHERMAL ENERGY DEVELOPMENT



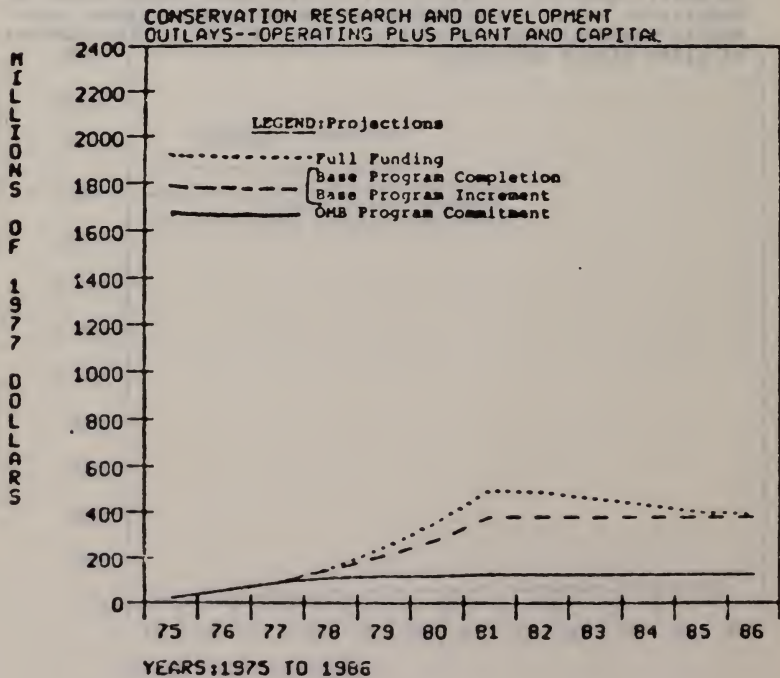
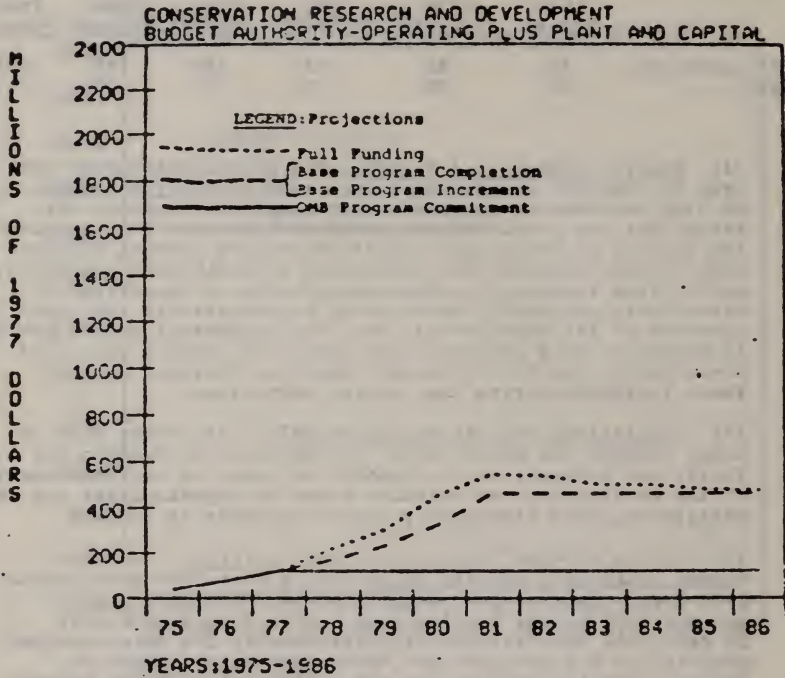
	FY 1977 Request					
	1975 Actual	1976 Estimate	TQ Estimate	Div. Request	ERDA Request	Pres. Budget
Budget Authority	28	31	12	102	90	50
Outlays	21	32	9	78	70	46

(1) Program Content and Trends. The geothermal energy program is designed to permit exploiting the energy potential of high temperature liquids, low temperature liquids, dry steam, hot dry rock, and geopressured resources deep beneath the surface of the earth. Major components presume improvement in understanding and assessment of geothermal resources, and include research to overcome problems in conversion to electricity and useful work caused by temperature and corrosiveness of the resource fluids. The geothermal energy program is augmented by a proposed loan guarantee program presented elsewhere in the FY 1977 budget which is designed to make funds available during the initial technology.

(2) Initiatives and Issues for FY 1977. As in the case of solar energy, the basic issue is the level of funding for a fairly new program, which depends, in turn, on the assessment of the availability of suitable research opportunities and the ability to spend effectively large increases in funding.

(3) Future Program Implications and Decisions. A fully funded geothermal program would have a near-term peak around 1980-1981, followed in the mid to late 1980s by a second and possibly larger program peak. This second peak will be dependent upon interim progress made in the more advanced geopressure and hot dry rock technology areas. However, overall budget authority for the geothermal research program is never expected to raise this program above ninth place in importance among energy R&D programs and alternatives, primarily because of the relatively small scale and low numbers of pilot plants envisaged.

D. CONSERVATION RESEARCH AND DEVELOPMENT



	FY 1977 Request					
	1975 Actual	1976 Estimate	TQ Estimate	Div. Request	ERDA Request	Pres. Budget
Budget Authority	36	75	17	262	243	120
Outlays	21	56	14	199	181	91

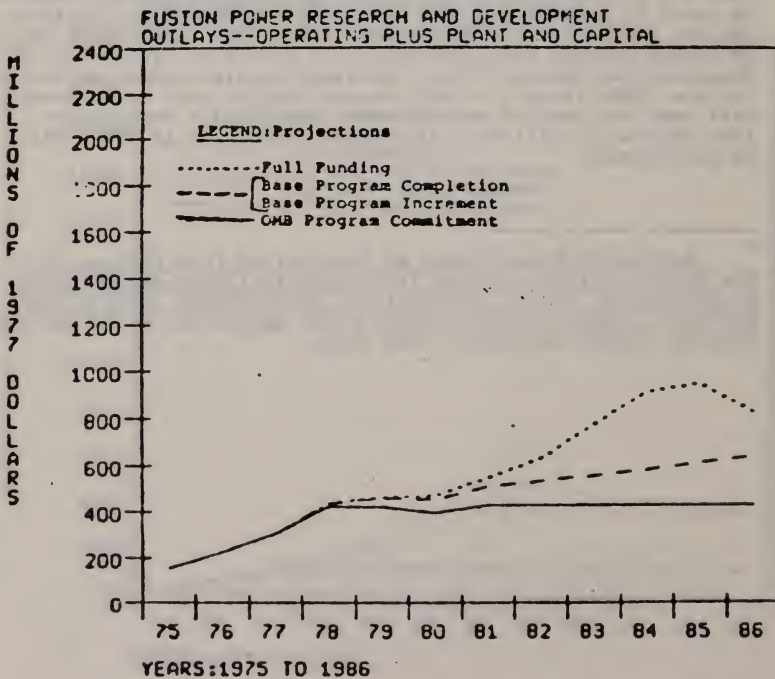
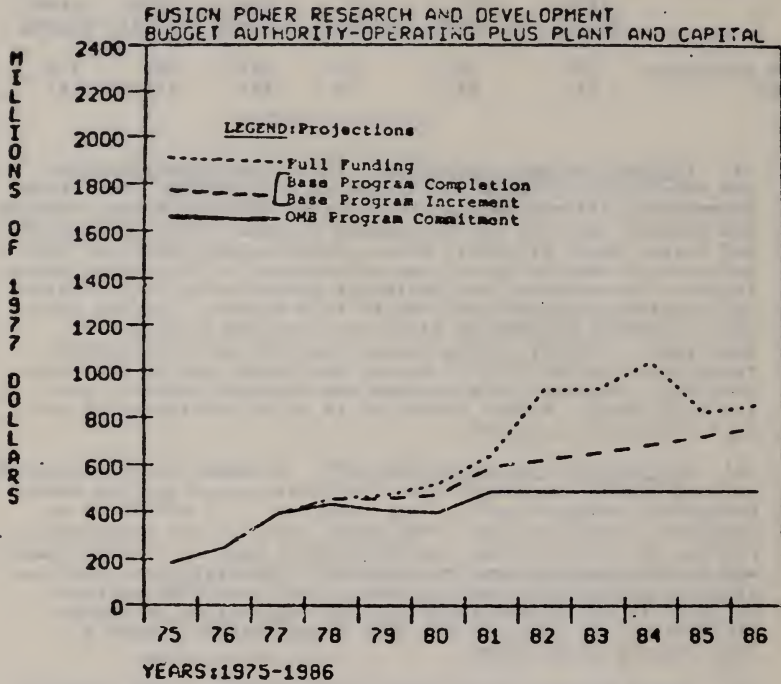
(1) Program Content and Trends. The conservation research and development program has two major subprograms. The first encompasses efforts designed to improve electric energy systems and develop feasible energy storage systems, while the second and larger deals primarily with end-use conservation and technologies to improve conversion efficiency. Within these areas, industry conservation and buildings conservation have received the greatest emphasis over the FY 1976 request. On the other hand, improved conversion efficiency funding is down over last year. Overall, conservation research and development ranks ninth in the FY 1977 energy R&D budget out of ten major programs. However, this program has expanded robustly over its 1976 level. Budget authority is up 60.0 percent and outlays are up 62.5 percent.

(2) Initiatives and Issues for 1977. A recent study conducted on Long Island^{*} concludes that conservation and end-use demand management measures are at least as effective as increased supply options. The major issue in the conservation program is to what level should the base program of experiments and field demonstrations be expanded. Administrators familiar with the conservation R&D community feel that \$600 million per year is not unreasonable for R&D communities to absorb ultimately; at issue is how fast - and whether - such a level should be attained.

(3) Future Program Implications and Decisions. The conservation R&D program has the potential for sizeable future increases in level of program effort. In general, conservation projects are not particularly capital-intensive in the traditional sense of moving forward from experiments to pilots to near-commercial demonstration plants. Thus, the rapid program growth anticipated for the 1980s (should a full program funding path be followed) will take the form of many diverse, small-scale experiments that separately will be small budget items, but in total will be significant.

* Analysis of Energy Usage on Long Island from 1975 to 1995, The Opportunities to Reduce Peak Electrical Demands and Energy Consumption by Energy Conservation, Solar Energy, Wind Energy and Total Energy Systems, Dubin, Fred, Department of Environmental Control, County of Suffolk, New York.

E. FUSION POWER RESEARCH AND DEVELOPMENT



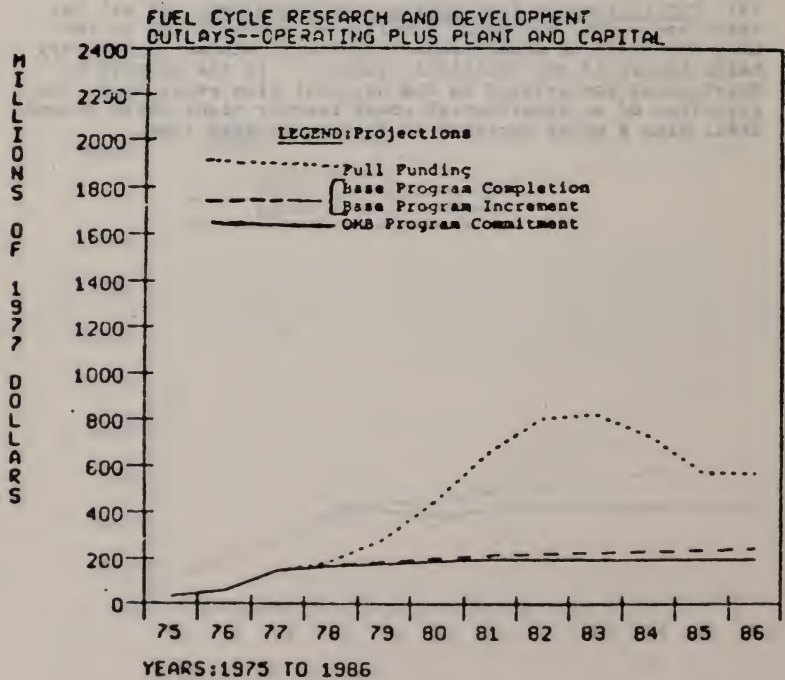
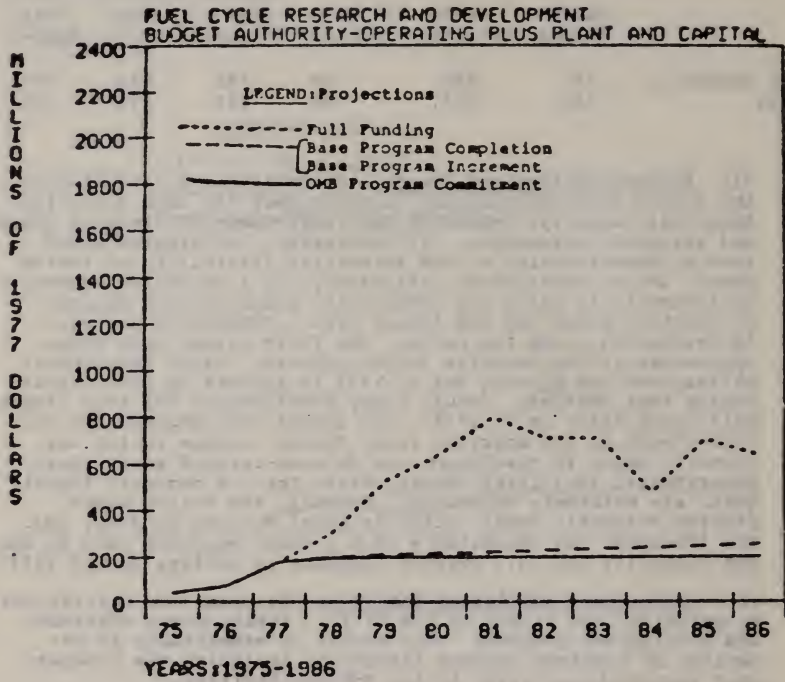
	FY 1977 Request					
	<u>1975 Actual</u>	<u>1976 Estimate</u>	<u>TQ Estimate</u>	<u>Div. Request</u>	<u>ERDA Request</u>	<u>Pres. Budget</u>
Budget Authority	183	250	80	685	624	392
Outlays	151	224	65	542	475	304

(1) Program Content and Trends. While it has a long history, the fusion power R&D program is still very far from achieving technical maturity, because of the intractable problems in physics and advanced engineering. If successful, the program could lead to demonstration of the scientific feasibility of fusion power, and to development, ultimately, of a reliable, economic, environmentally safe, and essentially inexhaustible source of electric power for the longer term. Subprogram emphasis is developing along two paths. The first relies upon three approaches to the magnetic fusion process. Major procurement obligations are planned for FY 1977 in support of the Tokamak fusion test reactor. Actual heavy construction for this facility will begin early in FY 1978. The second path encompasses continued work on the emerging laser fusion process (which was formerly shown in the budget for defense-related activities). Experimental facilities, particularly for the magnetic techniques, are extremely expensive. Overall, the fusion power program currently ranks fourth in total program funding, and the President has requested a 56.8 percent increase rate in budget authority and 35.7 percent increase in outlays for FY 1977.

(2) Initiatives and Issues for 1977. No major new initiatives or questions are raised in the FY 1977 fusion power research and development program. This budget is essentially an extension of previous program intentions including the accelerated support being given to the Tokamak facility.

(3) Future Program Implications and Decisions. Of all the major energy R&D programs, the future program shape is the most difficult to predict, in large part because of the very basic nature of the technical problems. If the pattern of development conjectured in the National Plan eventuates, construction of an experimental power reactor might begin around 1982, with a major increase in funding at that time.

F. NUCLEAR FUEL CYCLE RESEARCH AND DEVELOPMENT



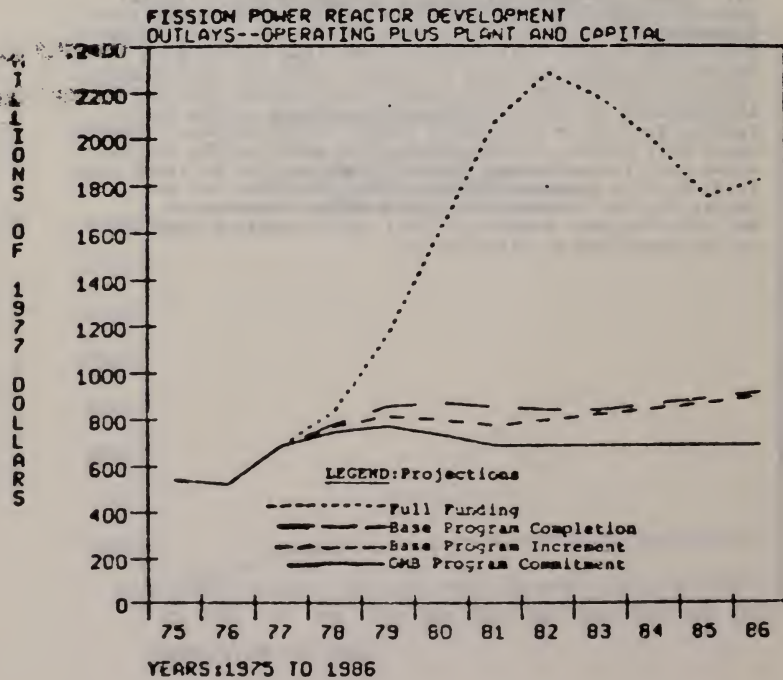
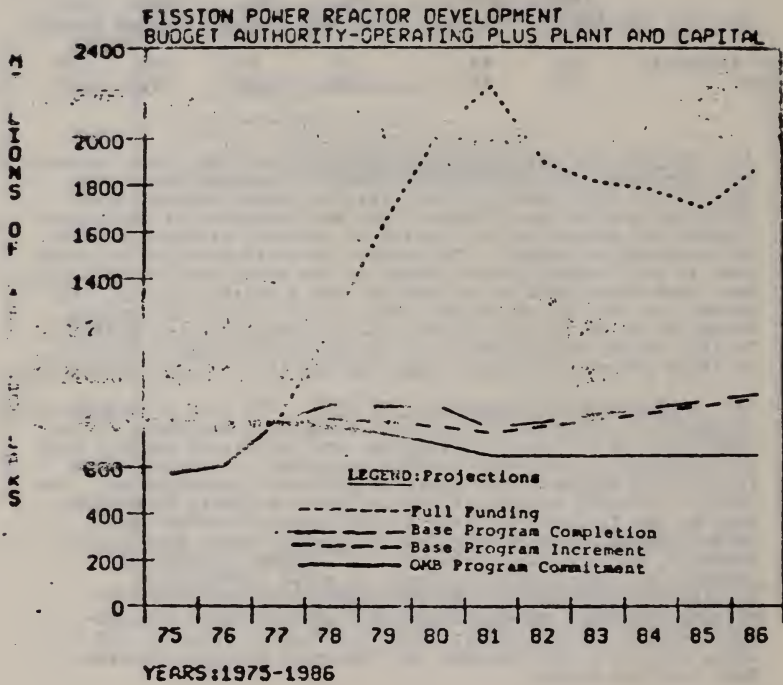
	FY 1977 Request					
	1975 <u>Actual</u>	1976 <u>Estimate</u>	TQ <u>Estimate</u>	Div. <u>Request</u>	ERDA <u>Request</u>	Pres. <u>Budget</u>
Budget Authority	36	69	21	336	336	179
Outlays	32	59	18	222	222	147

(1) Program Content and Recent Trends. The fuel cycle research and development program includes uranium resource assessment activities, development of commercially viable technologies for reprocessing spent reactor fuel and recycling of recovered uranium and plutonium, and design of terminal storage concepts for radioactive wastes. The largest increase among these areas over FY 1976 budget levels occurs in the commercial waste management subprogram both in an absolute and a relative sense. Although the fuel cycle program ranks sixth overall in program budget size, it is the fastest growing program in the President's FY 1977 energy R&D budget, with requested increases in FY 1976 or 159.4 percent in budget authority and 149.2 percent in outlays.

(2) Initiatives and Issues for FY 1977. The size of the increases requested for this program reflect increasing awareness of the importance of the total fuel cycle, and increasing concern with the problems of radioactive waste management. Another issue is relative emphasis on support of different technologies. The fission research program is placing heavy emphasis on development of the liquid metal fast breeder reactor (LMFBR) and on the future development of existing eight water (converter) reactors, and the fuel cycle program includes support of research on reprocessing tailored to these technologies. It also contains support for reprocessing wastes from a high-temperature gas-cooled reactor (HTGR), whose development receives little support from the fission program, and whose sole U.S. manufacturer has indicated a desire to withdraw from the market.

(3) Future Program Implications and Decisions. If full program funding is carried out in accordance with the time-schedule set forth in the National Plan, then the nuclear fuel cycle program will increase more than fourfold by 1981, moving from sixth to third in budget authority as a percent of total energy R&D. This substantial program increase is attributable to large construction projects in the three reactor/fuel cycle technology areas. In particular, liquid metal fast breeder reactor fuel cycle construction projects alone could require total federal investment of at least \$1.35 billion between 1978 and 1986. At issue for the longer term is how many fission reactor technologies - and thus how many supporting fuel cycle research programs - can be supported at large scale.

G. FISSION POWER REACTOR DEVELOPMENT



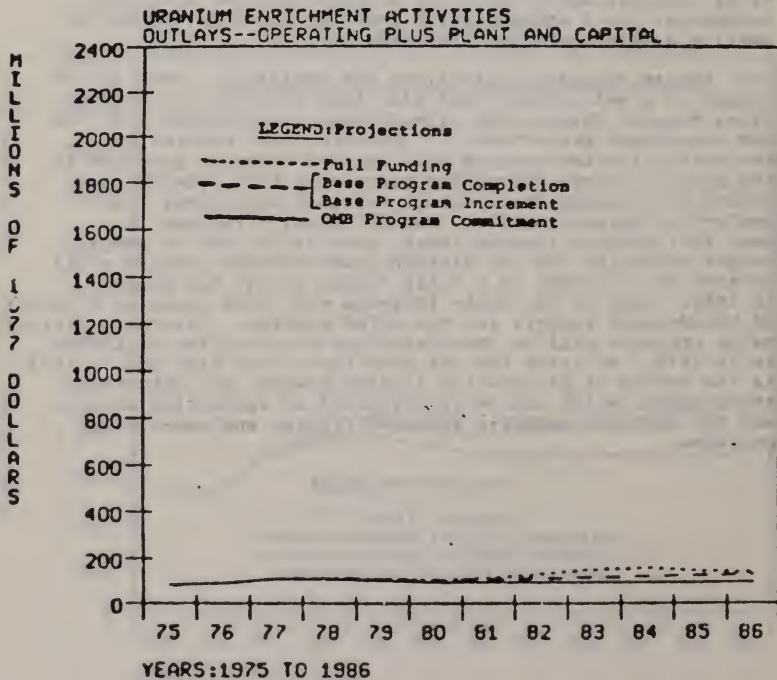
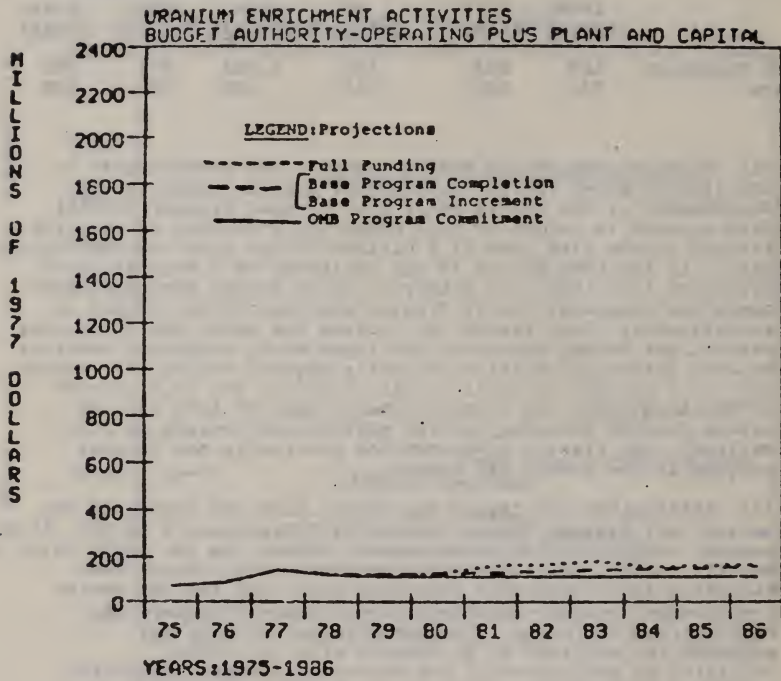
	FY 1977 Request					
	1975 Actual	1976 Estimate	TQ Estimate	Div. Request	ERDA Request	Pres. Budget
Budget Authority	567	602	137	1,063	941	790
Outlays	538	522	158	900	793	684

(1) Program Content and Recent Trends. The major effort in the fission power reactor development program supports the development of the liquid metal fast breeder reactor (LMFBR). This program is unique by ERDA budgeting standards in that the largest single item (the \$1.5 billion Clinch River demonstration plant) in the ERDA budget is not reflected as a separate construction line item, but rather is being funded entirely under operating expenses. Other fission subprograms are funded at significantly lower levels and include the water cooled breeder reactor, gas cooled reactors, and light water convertor reactors. By both percent of total President's request for FY 1977 energy R&D (25.4 percent of total budget authority and 25.6 percent of total outlays) and absolute change over FY 1976 funding levels (budget authority up 188 million and outlays up \$162 million), the fission power reactor program is the largest program in the energy R&D budget.

(2) Initiatives and Issues for 1977. With the demise of the molten salt breeder reactor in the 1977 President's budget, three breeder reactor technologies remain. These are the LMFBR which is heavily funded, the light water breeder reactor which was allocated less funds this year than last, and the gas cooled fast breeder reactor which received a modest increase over FY 1977 funding levels. Considerable controversy has attended the decision to go forward with the LMFBR, focussing on environmental and safety questions. Regarding convertor reactors, evaluation of current generation light water reactors continues in an attempt to level a broader technology base, and to assist industry in achieving better on-line availability and productivity.

(3) Future Program Implications and Decisions. Most of the impact of a well funded fast flux test facility and Clinch River Breeder Reactor has already been incorporated into the OMB commitment projection. However, full funding of the entire fission program will cause a dramatic increase in the size of future energy R&D budgets as this program continues to maintain its dominant position throughout the projection period to 1986. When it finally reaches its peak full program funding level, over \$2 billion in annual budget authority for the fission power reactor program could consume 30.7 percent of a fully funded energy R&D budget in 1981. Much of the early increase will come about as a result of broad-based support for the LMFBR program. Several additional major projects will be candidates for construction beginning in FY 1978. At issue for the long term - but also for FY 1977 - is the number of alternative fission breeder and convertor technologies which can be investigated at increasing scales, and the relative emphasis accorded fission and non-nuclear programs.

H. URANIUM ENRICHMENT ACTIVITIES



	FY 1977 Request					
	1975 <u>Actual</u>	1976 <u>Estimate</u>	TQ <u>Estimate</u>	Div. <u>Request</u>	ERDA <u>Request</u>	Pres. <u>Budget</u>
Budget Authority	71	87	25	233	214	140
Outlays	81	89	22	151	142	108

(1) Program Content and Trends. Current nuclear power plants are fueled by a fissionable variant of uranium. To be useful, naturally-occurring uranium must be "enriched" to a higher concentration of its fissionable component. ERDA currently owns and manages all existing U.S. enrichment facilities, whose funding appears in the General Operating Programs portion of the Energy subfunction, not the R&D portion.* Uranium enrichment activities funded in the energy R&D program include development (gaseous diffusion and advanced isotope gas centrifuge enrichment process and advanced technologies), separation technology (primarily the evaluation of alternative laser-induced U-235 separation techniques). The President's budget for FY 1977 requests a 60.9 percent increase in budget authority over FY 1976, principally as a result of the first phase funding request for the centrifuge plant demonstration facility.

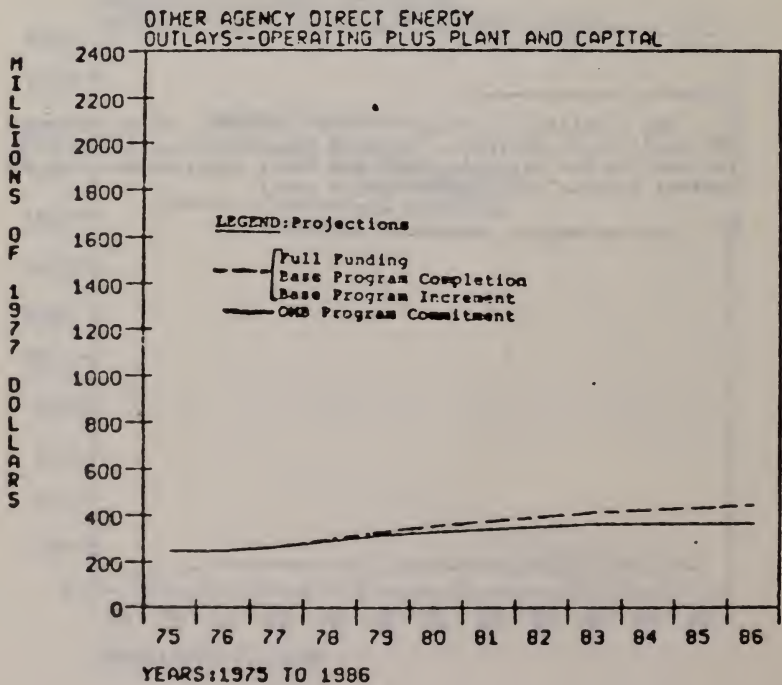
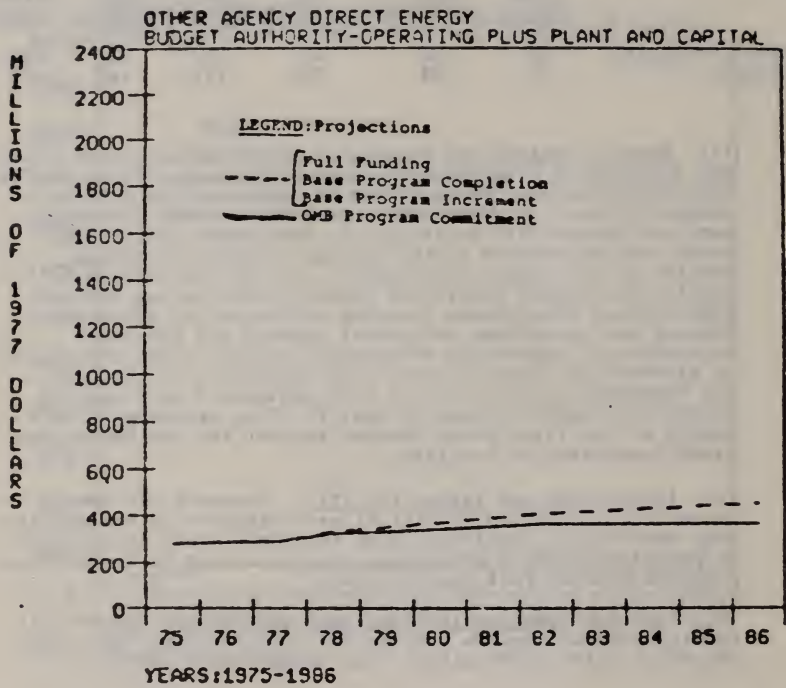
(2) Initiatives and Issues for 1977. Emphasis has been placed upon increased industrial participation in gas centrifuge technology, consistent with the Administration's effort to privatize uranium enrichment as articulated in the recently proposed Nuclear Fuel Assurance Act.*

(3) Future Program Implications and Decisions. Future full funding program impacts will be relatively modest, with only one major pilot plant planned for about 1981.

* For a fuller discussion of that subject, see a companion CBO staff draft analysis, "Uranium Enrichment: Alternatives for Meeting the Nation's Needs and their Implications for the Federal Budget," in preparation.

** See the report referenced earlier.

I. OTHER AGENCY DIRECT ENERGY R&D



	<u>1975</u> <u>Actual</u>	<u>1976</u> <u>Estimate</u>	<u>TQ</u> <u>Estimate</u>	<u>FY 1977</u> <u>Request</u>
Budget Authority:				
NRC	--	110	--	122
EPA	--	112	--	96
DOI	--	58	--	62
Other Miscellaneous	--	17	--	11
Total Other Direct	--	(297)	--	(291)
Outlays:				
NRC	--	94	--	116
EPA	--	87	--	75
DOI	--	52	--	64
Other Miscellaneous	--	14	--	9
Total Other Direct	--	(247)	--	(264)

-- Not estimated

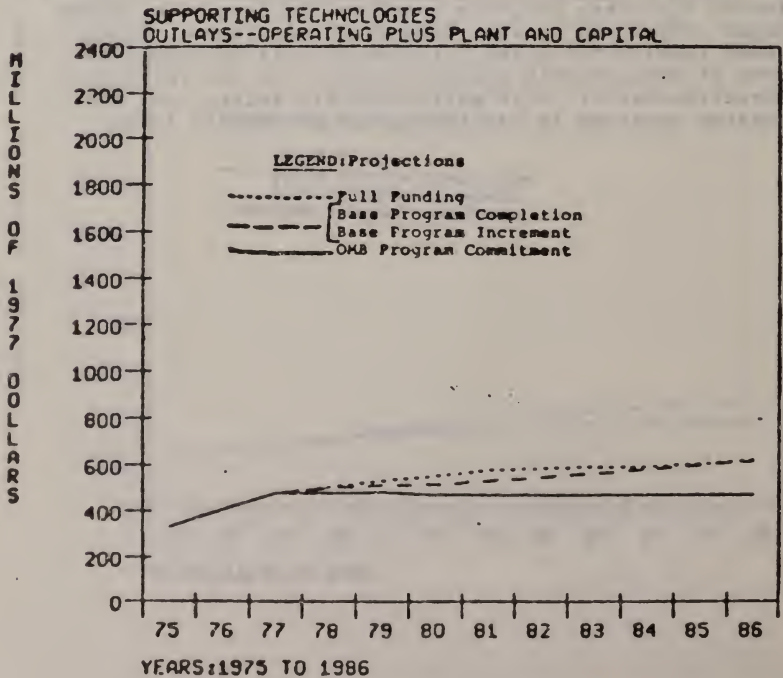
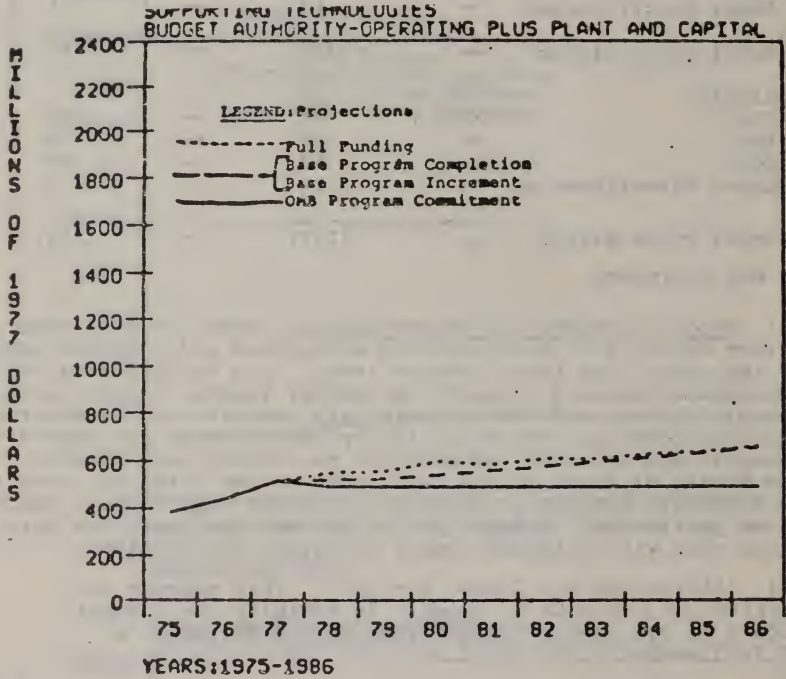
(1) Program Content and Recent Trends. Other federal agency direct energy R&D involvement is widespread and augments many of the other nine major program areas. The Nuclear Regulatory Commission conducts research on nuclear reactor safety, environmental studies, and nuclear materials security and safeguards. The Environmental Protection Agency investigates environmental impacts, and develops technologies to control such impacts. The Bureau of Mines of the Department of the Interior conducts an extensive program of research on mining coal and oil shale. Other portions of Interior, and numerous other agencies play a minor role with extremely small budgetary implications.

(2) Initiatives and Issues for 1977. This program is typified by business as usual. It exhibits the slowest growth of all energy R&D programs in the President's FY 1977 budget.

(3) Future Program Implications and Decisions. No items planned for these programs approach the magnitude of the larger fossil and nuclear demonstration plants. Basic issues involve the extent of work on a large number of items at considerably smaller scales, and the relative attractiveness of these environmental, safety, and mining research programs as candidates for energy R&D funds.

J. SUPPORTING TECHNOLOGIES

(ENVIRONMENTAL RESEARCH AND SAFETY, BASIC ENERGY SCIENCES, AND NUCLEAR MATERIALS SECURITY AND SAFEGUARDS)



	1975 Actual	1976 Estimate	TQ Estimate	FY 1977 Request		
				Div. Request	ERDA Request	Pres. Budget
Budget Authority:						
Env. Res. & Saf.	183	213	55	481	378	260
Basic Energy Sci.	191	211	54	336	390	227
Nuclear Matl's						
Sec. & Saf'gds	10	17	4	34	29	28
Total Supporting	384	541	113	851	697	515
Outlays:						
Env. Res. & Saf.	159	204	54	384	336	244
Basic Energy Sci.	165	188	52	300	271	204
Nuclear Matl's						
Sec. & Saf'gds	7	15	4	34	29	27
Total Supporting	331	407	110	718	636	475

(1) Program Content and Recent Trends. The supporting technologies program is an amalgam of (1) environmental research and safety, which includes biomedical and environmental research, operational safety, environmental control technology, and reactor safety facilities, (2) basic energy sciences, encompassing nuclear science, materials sciences, and molecular, mathematical, and geo-sciences, and (3) nuclear materials security and safeguards.

(2) Initiatives and Issues for 1977. Expanded initiatives in the supporting technologies area for 1977 have occurred in both the nuclear materials security and safeguards program (for continuing improvements in safeguards procedures and systems to prevent possible diversion of special nuclear material) and the nuclear reactor safety facilities subprogram. On the other hand, the nuclear science subprogram was cut, especially in the area of low energy nuclear science.

(3) Future Program Implications and Decisions. The only big ticket items scheduled at full program funding are three relatively small items (an intense pulsed neutron source, an advanced synchronous radiation source, and a very high flux neutron source).

OIL STOCKPILES

SUMMARY

Strategic Storage, Introduction and Background:

- Strategic Storage consists of petroleum taken from natural reservoirs and placed in man-made storage facilities for rapid and easy access. It is not construed to be oil in the ground, such as that in the Naval Petroleum Reserves.

- The primary purpose of a strategic petroleum reserve is to protect the U.S. from the disadvantageous impact of an abrupt interruption in the flow of imported petroleum products. However, a large inventory of petroleum can also permit the government to participate directly in petroleum markets for price stabilizing purposes.

- The Energy Policy and Conservation Act (December, 1975) (EPCA) mandates creation of a strategic petroleum reserve in two stages: an early stage to be completed within 3 years at a minimum level of 150 million barrels and a follow-on stage to be completed within 7 years which would bring total stored petroleum to just under 500 million barrels. Current imports total approximately five million barrels of crude per day. The Act declares it takes U.S. policy to provide storage for up to one billion barrels of petroleum products, but not less than 150 million barrels. The Administrator of the Federal Energy Administration is charged with submitting by the end of this year, plans to implement these provisions of the Act.

Even though EPCA mandates the establishment of a reserve between 150 million and 1.0 billion barrels, a number of issues will have to be resolved by the Congress incident to granting approval for the Federal Energy Administration's plan of implementation. Some likely issues are addressed here: How big should the reserve be? How should it be filled? What conditions should be prescribed regarding the use of the reserve? What is the program likely to cost, including financial arrangements and budgetary impact?

The Size of a Strategic Reserve:

- The size desired for a reserve depends upon import vulnerability and the relative cost to the economy of an interruption juxtaposed to the cost of storage itself. Import vulnerability depends on the level of imports, the likelihood of an interruption, and the length of time an interruption is likely to last. In addition, emergency conservation measures are a way of reducing in the short run dependency on imports. The EPCA calculates a stipulated level of storage capacity based upon import levels of crude oil, only, in 1975. Actual imports in 1975 included a significant quantity of refined petroleum products, which if included would alter the base calculation significantly. Anticipated imports in 1985 are likely to be much greater than those experienced in 1975.

- The stipulated amount of storage (three months of the high monthly average level of crude oil in 1975) 420-450 million barrels in storage mandated by EPCA would provide at least 140 days of protection from another interruption comparable to the organization of Petroleum Exporting Countries (OPEC) embargo of 73-74.

- Emergency conservation measures might reduce short run consumption by as much as 1.7 million barrels/day. However, these measures cannot be construed as long-term solutions to the problems associated with an interruption. They also pose economic costs associated with the disruption of normal activity when they are imposed.

- The value of a national strategic petroleum reserve might be viewed in terms of the potential losses in Gross National Product (GNP) that would result from an interruption. Estimates of the economic losses associated with monthly embargo, range as high as \$186 billion for a one year interruption in 1985.

Method of Fill

- The two primary problems regarding filling the storage facilities with fuel, relate to determining the source of the fuel and the rate at which the reserve will be built up. Sources of fill are Federal Royalty Oil, imported oil, domestic oil, or oil from Natural Petroleum Reserves. The least expan-

sive source of fuel, in out-of-pocket costs, is that located in the NPRs, specifically NPR #1 at Elk Hills. The rate of fill will largely be determined by the maximum efficient rate of production from NPR fields, assuming storage facilities are already on line.

Drawdown of the Reserve:

- Decisions on the conditions under which the reserve should be emptied can have an impact on cost, equity, and success with which the program meets its objective of offsetting an interruption of imports which may fluctuate in magnitude and be uncertain in duration.

Costs:

- The cost of a strategic petroleum reserve will be very sensitive to the source of petroleum. A mid-range estimate for a 500 million barrel program, consisting of two increments of 150 million and 350 million barrels, is on the order of \$2.4 billion in 75 dollars over the seven year period. This estimate assumes that all of the first stage oil and 90% of the second stage oil comes from NPRs. If, on the otherhand all of the oil came from imports, costs in current dollars could reach \$6.8 billion over seven years.

Financing:

- Current plans implicit in the President's FY '77 budget

URANIUM ENRICHMENT

SUMMARY

Congress is presently being asked to decide who should own and manage the next generation of uranium enrichment facilities. Should the federal government continue to own and manage all U.S. enrichment facilities, as it does now, or should future additions to capacity become the responsibility of the private sector?

The Current Situation

The current generation of nuclear power plants is fueled by a fissionable variant of uranium. Uranium in its natural state does not contain enough of its fissionable component to sustain the chain reaction required to power a nuclear reactor. Naturally-occurring uranium must therefore be "enriched" to a higher concentration of fissionable quality before it can sustain the controlled nuclear reaction which produces electricity. Technology to accomplish this enrichment has existed for more than 30 years; it was first developed by the U.S. Government during World War II to produce the even higher fissionable concentrations required for nuclear weapons. Since the war, the government has also used the technology to supply enriched nuclear fuel to electric utilities

for commercial power generation. The government has continued to own the technology, which is classified because of its implications for national security. Enrichment facilities are large, complex and expensive to construct; they are also expensive to operate.

Three U.S. uranium enrichment facilities exist today, all owned and managed by the Energy Research and Development Administration (ERDA) but operated by private industry under contract. These facilities, at maximum production, can annually service the equivalent of about 172 power plants with a generating capacity of 1000 megawatts (MW) each -- the typical size for a nuclear power plant. The United States currently has the equivalent of 37 1000-MW nuclear power plants operational. In addition, because the United States has 95 percent of the present free world enrichment capacity, it also provides enrichment services to the equivalent of 31 1000-MW foreign nuclear power plants. By 1985, ERDA estimates that there will be the equivalent of approximately 185 domestic nuclear plants and the equivalent of approximately 385 foreign nuclear power plants.*

*These figures are based on ERDA's mid-range projections of domestic and foreign nuclear generating capacity anticipated to be on-line by 1985. For domestic projections, see U.S. Energy Research and Development Administration, "Total Energy, Electric Energy, and Nuclear Power Projections, United States," February, 1975, and ERDA's testimony before the Joint Committee on Atomic Energy in June, 1975. For foreign projections, see ERDA's "Draft Environmental Statement, Expansion of U.S. Uranium Enrichment Capacity" (ERDA-1543), June, 1975.

Currently planned additions to existing government-owned enrichment facilities will increase U.S. capacity by 63 percent by 1983. ERDA indicates that this entire capacity has already been committed to both domestic and foreign customers. By 1985, ERDA estimates that total enrichment capacity will have to increase yet another 15 percent -- or enough cumulative capacity to service the equivalent of over 300 1000-MW power plants -- to meet projected United States demand and to maintain a 35 percent share of the projected foreign market. The balance of foreign demand will be made up by planned foreign-built uranium enrichment facilities.

Because ERDA's enrichment capacity is presently greater than the demand for services, ERDA has been stockpiling enriched fuel for future sale; if existing and planned government-owned capacity additions were run at full capacity (which is not now the case because sufficient electricity is not always available), the resulting stockpile could, by 1985, provide between one and two years' supply of the total demand which the United States expects to meet at that time.

The extent and timing of the need for increases in enrichment capacity beyond that currently planned at existing government-owned facilities will depend strongly on the extent of the future role of nuclear power in the United States and on the U.S. share of growth in foreign demand for enriched uranium.

Based on an analysis of a variety of estimates of anticipated future nuclear generating capacity, it appears likely that further additions to enrichment capacity beyond those now planned will be needed in the mid-1980s. Because of long lead times, planning--and perhaps funding--for these additional plants must be undertaken in the near future if they are to be ready when needed. The amount of new capacity using existing or contemplated technology could range from 180 percent to 330 percent by the year 2000, depending upon how conservatively or how optimistically one assesses the future role of nuclear power. By accelerating the rate of additions to the stockpile and making it available to future domestic customers, and by reducing the rate of commitment to future foreign customers, it might be possible to moderate the timing at which the next generation of enrichment facilities is brought on-line. While the exact number of new U.S. facilities that will be needed is uncertain, current estimates range from two to ten.

There are two principal enrichment technologies that could be used to supply potential future needs: diffusion and centrifuge. To date, the gaseous diffusion process has provided U.S. capacity. It is a mature, reliable process, with 30 years of large-scale operating experience behind it.

The centrifuge process is a newer technology which is anticipated to have several advantages over the diffusion method, including smaller viable commercial operating levels (one-third the size of an economically feasible diffusion plant), lower electricity requirements, and potentially lower costs of construction and operation. Because of its promise, the centrifuge process is generally considered to be the enrichment technology of the future. Nevertheless, because the centrifuge has not yet been commercially proven, the older diffusion process is expected to be the method used for the next U.S. enrichment facility constructed.

Issues and Options

There are four basic options for the ownership of U.S. enrichment capacity: (1) Ownership of all new capacity could be transferred to the private industrial sector; (2) The federal government could continue to own and manage through ERDA all enrichment facilities, including new capacity; (3) The federal government could build and own the next major increment of capacity (using diffusion technology) and future increments involving centrifuge technology could be built and owned by private industry; and (4) Ownership of all new capacity--and existing capacity if desired--could be transferred to a separate government corporation that would be created expressly for this purpose.

Regardless of the option selected, the capital required for construction will be basically the same. Besides cost, however, there are a number of other criteria against which each of the options can be measured. These include: effectiveness in advancing the development of new enrichment technology, cost to consumers, environmental impact, effects on U.S. capital markets and balance of payments, and impact on the federal budget.

The Case for Private Ownership

Several arguments underlie the case for private ownership. The first is that the proper role of the federal government in providing energy technologies is support of research and development, leaving commercial applications to the private sector; the second (and corollary) argument is that there will be sufficient firms participating in the private sector to ensure competitiveness, which -- it is argued -- would result in potentially more appropriate market prices for enriched fuel, improved technological advances, increased foreign capital investment and trade, and lower direct federal outlays. Pricing policies would be set by competing producers at levels reflecting their costs and fair market values. In order to maximize profits, industry would seek the most efficient production methods and would pursue new and improved technologies. Private firms might find it easier to solicit foreign capital

investment, thus relieving stresses on domestic capital markets. In addition, the incentive of increased profits from foreign sales might make private industry more likely than the government to sell enriched fuel abroad, thereby improving the U.S. balance of payments.

Finally, to the extent that the private sector finances capacity that would otherwise be built by the government, federal outlays could be reduced. The government would collect revenues in the form of agreed-upon royalty payments in return for having turned over its technology to industry. In addition, corporate profits would be taxed in the normal fashion. Off-setting these revenues, however, would be increased tax expenditures (due primarily to tax write-offs under the investment tax credit) and the loss of revenues from direct federal sale of enriched uranium. The potential range of these impacts is described below.

The Case for Government Ownership

The case for government ownership -- whether through ERDA or a government corporation -- is based on the following arguments. Because of uncertainties regarding future markets for enriched uranium, and the high initial capital needed, it is unlikely that private firms would enter the industry in sufficient numbers to assure competitiveness. This makes it unlikely that many of the benefits attributable to private sector ownership could be achieved.

In addition, government ownership could lower costs to consumers, because prices could be set at as low a level as Congress would permit, even subsidizing electric utilities and their consumers if this is judged desirable. By directly controlling its own facilities, the government would be better able to minimize potential adverse environmental impacts. Technology development could be accelerated by an aggressive federal program for research and development. Finally, budgetary impacts would, in the long-term, be favorable with government ownership. While outlays would exceed revenues in the early years, this situation would be reversed when sales revenues exceed costs of construction and operation.

The Case for a Mixed Option

The case for mixed ownership -- some government and some private -- of further additions to capacity can be made on a combination of the arguments listed above, particularly if the government is limited to providing only the next large enrichment facility. Because this facility is likely to be built using the mature diffusion technology, it is possible that even under the spur of competition private enterprise would be unable to achieve significant technical or cost advances. Also, additions to existing capacity owned by the government would cost less than construction of a new stand-alone plant because such additions could expand facilities

already in place. Finally, there is little risk in applying diffusion technology, and ownership of that facility can be considered separately from subsequent additions to capacity that would employ a less mature technology.

The Case for a Government Corporation

The case for creating a separate government corporation to own and operate future enrichment capacity is identical to the case made above for continued government ownership through ERDA, with one important exception: ownership through a government corporation could result in minimal or non-existent impacts on the federal budget. Such a corporation could be set up so that it would be entirely self-financing or so that only its annual gains or losses are included in the budget. A discussion of several potential variations in the structure of such a corporation is contained in a recent GAO report evaluating the Administration's proposal to transfer responsibility for providing future enrichment capacity from government to private industry.*

Potential Budgetary Impacts

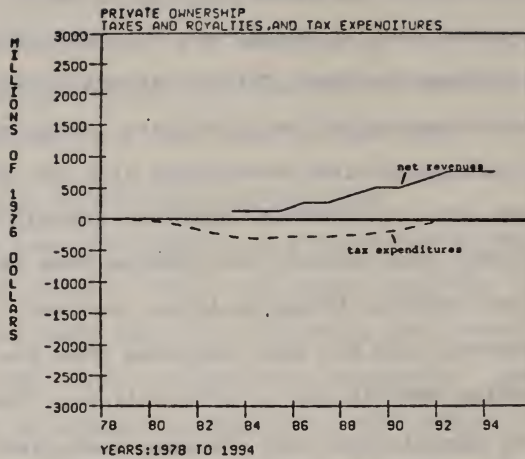
The choice of private, government or mixed ownership of new enrichment capacity could have significant effects on

* Comptroller General of the United States, Report to the Joint Committee on Atomic Energy: Evaluation of the Administration's Proposal for Government Assistance to Private Uranium Enrichment Groups (RED-76-36), October 31, 1975, pp. 36-40.

federal budgets in terms of expenditures and revenues. While the FY '77 budget outlays would not be significantly affected by any of these options, future outlays could change sizably. The figures which follow illustrate the pattern of revenues and tax expenditures associated with the options. The revenues shown are net revenues; that is, certain government costs associated with each of the options have been deducted from total revenues which would be received. Tax expenditures, however, have not been deducted from the net revenues. All dollar amounts are in 1976 dollars. These totals reflect the expenditures and revenues associated with constructing six new enrichment facilities; depending on future demands for increased enrichment capacity, as few as two or as many as ten facilities could actually be needed.

The pattern for the first three options is similar in some respects. If the effects of tax expenditures are taken into account as well as net revenues, there would be an increasing burden on the budget throughout the early 1980s under all three options. By the mid and late 1980s, the burden could begin to decrease to a point at which expenditures and net revenues would be equal. Beyond that time, net revenues would in each case increasingly exceed expenditures so that the latter are recouped.

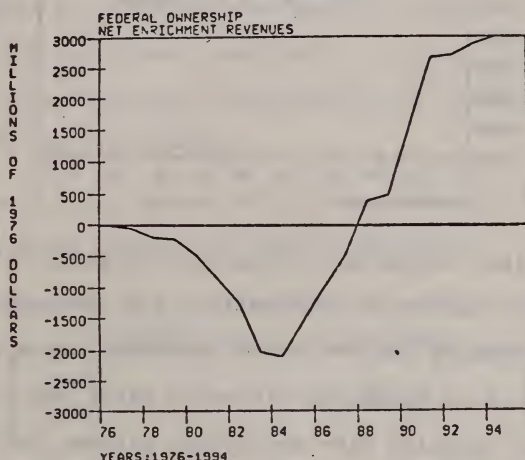
Figure A



As shown in Figure A, if private industry were to own all new capacity beyond that currently planned, federal outlays would not be required for new additions, either in FY '77 or beyond. This assumes, of course, that private enrichment facilities are successful so that no federal financial guarantees are invoked by industry. The federal government would not receive revenues from additional sales of services, but it would receive royalties for use of its technologies and would collect ordinary business taxes. These revenues would be partially countered, however, by tax expenditures resulting from industry's annual write-off of part of the construction expenses due to provisions of the investment tax credit. Under this option, the "crossover" date -- when annual net revenues begin to exceed annual expenditures -- would be 1988. The date of recoupment -- when cumulative net revenues exceed

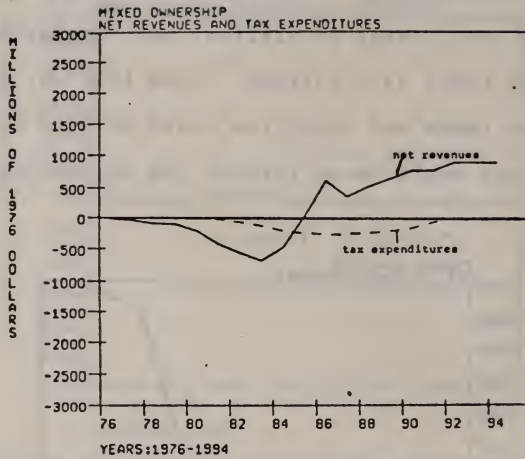
cumulative expenditures -- would be 1991. By 1994, cumulative net revenues could total \$5 billion, and cumulative tax expenditures could total \$2.7 billion. From 1994 on, federal net revenues from taxes and royalties could be \$740 million annually; there would be no further tax expenditures.

Figure B



If the government were to own all new future capacity, as shown in Figure B, direct federal outlays would rise substantially during the next decade as the plants are constructed. Revenues from the sale of services would also increase, although not sufficiently to offset the outlays until 1988. The date of recoupment would be 1993. By 1994, cumulative net revenues could total \$3.1 billion; there would be no tax expenditures associated with this option. From 1994 on, federal net revenues from sales of enriched fuel could be as much as \$3.0 billion annually.

Figure C

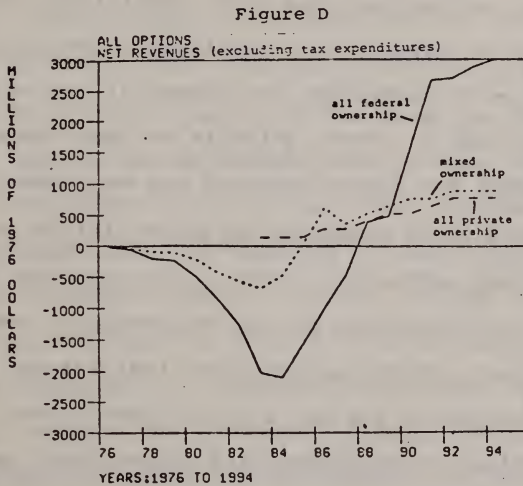


If a mixed option were selected, as shown in Figure C, the impacts on both outlays and revenues would fall within the range of the two cases described above. If the government were to build one diffusion plant and private industry were to build five centrifuge plants, the crossover date would be 1985 and the date of recoupment would be 1993. By 1994, cumulative net revenues could be \$3.3 billion, and cumulative tax expenditures could be \$2.2 billion. From 1994 on, federal net revenues -- from fuel sales, royalties and taxes -- could be \$50 million annually; there would be no further tax expenditures after 1992.

Finally, if a government corporation were created to build and own all new future capacity, impacts on the

federal budget would depend on the nature of its structure. If it were required to be entirely self-financing, there would be no direct federal expenditures. If its annual net gains or losses were to be included in the budget, the amounts could vary from year to year. However, such amounts could be much smaller and less variable than the net revenues of the all-federal option shown in Figure B. Actual gains or losses, especially in early years, could depend on the financial arrangements and accounting practices adopted by the corporation.

Figure D superimposes net revenue projections for the first three options for easy comparison.



Decisions Facing Congress

The Administration supports transfer of responsibility for providing new enrichment capacity from government to the private sector. To accomplish this transfer, it has proposed the Nuclear Fuel Assurance Act -- NFAA -- (S.2035, H.R. 8401), which would provide private industry with certain guarantees and financial incentives. The bill would: (1) authorize ERDA to allow private industry to use classified enrichment technology; (2) require industry to pay royalties and to purchase from the government at full cost certain equipment, material and services; (3) allow ERDA and the participating private firms to enter into cooperative agreements that would establish the royalties, warranties, and other conditions; and (4) cause the government to warrant the transferred technology, backing that warranty with provisions for financial guarantees for contingencies such as future defaults on loans obtained by private industry for construction of new enrichment facilities.

The bill would authorize up to \$8 billion to guarantee the cooperative agreements. The relationship of this authorization to the provisions of the Congressional Budget Act of 1974 is unclear. Three alternatives that attempt to conform the authorization to the Act are described below.

The Office of Management and Budget (OMB) has developed a plan which, OMB holds, minimizes the apparent budgetary impact of commercializing uranium enrichment while satis-

fying requirements of the Congressional Budget Act concerning the definition of budget authority, the establishment of budget targets or ceilings, and the prohibition of backdoor spending.

According to OMB's plan, the NFAA would authorize up to \$8 billion in the form of contract authority, but ERDA would not enter immediately into contracts. Instead, subsequent to the passage of the NFAA, ERDA would request the approval of the Senate and House Appropriations Committees to enter into cooperative agreements with private industry; these agreements could involve part or all of the \$8 billion authorized in the Act. Because these cooperative agreements would not necessarily result in outlays, OMB argues, the amounts approved by the Appropriations Committees would not appear in the budget as budget authority and therefore would not count against budget targets or ceilings. According to OMB, this is consistent with the definition of budget authority in § 3(a)(2) of the Congressional Budget Act of 1974, because the agreements with private industry would create only "contingent liabilities." They are contingent in that the government would be required to take over the debt incurred by a private enrichment company, refund its equity investment, and complete the project at government expense only if private industry fails to operate the new enrichment facilities successfully. Because the government has successfully operated uranium enrichment services for many years, the Administration claims that it is unlikely that any project failures requiring outlays would actually occur.

If, however, it appeared likely at a later date that the government would be required to take over a project, ERDA would borrow the necessary funds from the Treasury and then request an appropriation to repay the Treasury. This appropriation would count against budget authority and outlay targets and ceilings in the year in which it occurs. It is open to question whether this interpretation would meet the requirements of the Congressional Budget Act.

A second alternative which appears consistent with the Budget Act would be for the entire \$8 billion to be appropriated in a lump sum and counted as budget authority at that time, thus affecting budget targets for that year. Outlays, however, would occur only if the contingencies were to become liabilities.

A third alternative would be the annual appropriation of any required budget authority in the yearly appropriations bills. If this were to take place, it would not be necessary for the Appropriations Committees to give prior approval to any proposed cooperative agreements; the committees would become involved only when appropriations were necessary to satisfy the terms of an agreement. This, however, could be interpreted to be backdoor spending.

The NFAA provides an immediate vehicle for Congressional decision in regard to providing enrichment capacity for potential needs beyond 1985. If Congress judges that the private sector should provide future capacity, it can enact the NFAA or other legislation to the same purpose. In this event, the Congress can determine whether diffusion as well as newer technologies would be transferred to the private sector. It can also establish the appropriate level of incentives and any consequent need for further budget authorizations.

If, however, Congress judges that the government should retain responsibility, it can reject the NFAA proposal and begin federal programs for providing further capacity.

In this event, the key issues would probably be the timing of new capacity, the fraction of the foreign market to be served (which will directly affect the amount of capacity needed), and the budget impacts, particularly in regard to increased outlay levels in the early years of an expansion program.

Other Considerations

It should be emphasized that other circumstances and policy decisions beyond the scope of this paper could have major effects on the nuclear power industry and, therefore, on the need for uranium enrichment services and the way in which they are provided. These separate considerations include decisions in regard to nonproliferation, safeguards, nuclear moratoria, and as-yet-unresolved issues about safety and ultimate disposal of nuclear wastes. Nonproliferation is particularly relevant, since uranium enrichment capacity developed for peaceful purposes can potentially be used to produce weapons material. Finally, Congress can expect to be asked to make decisions involving the shape of the Nation's total energy future, in which the size of the role accorded the nuclear component could vary considerably.

SYNTHETIC FUELS

1

I. SUMMARY

A. Synfuels Commercialization Programs

The President has proposed a program to bring synthetic fuels known as synfuels -- oil and gas produced from coal, oil shale, and urban waste -- into commercial production in the near future. The program would consist of price supports, loan guarantees, and construction grants designed to achieve an interim synthetic fuel production target equivalent to 350,000 barrels of oil per day, with an option of expanding the program to 1 million barrels per day by 1985 if the initial phase were successful.¹ Projects eligible for assistance would include:

- Conversion of coal to oil or gas.
- Extraction of oil from shale.
- Production of oil or gas from urban wastes.

The Conference version of the fiscal year 1976 Energy Research and Development Administration Authorization bill (H.R. 3474), would have provided for guarantees of up to \$6 billion in loans, but did not contain the other incentive provisions. Authorization of \$6 billion in loan guarantees would enable ERDA to offer guarantees to synfuels projects with a total production capacity of approximately 350,000 barrels per day.

B. Decisions Facing Congress

Congress may decide to:

- Accept or reject a synthetic fuels commercialization proposal as a whole, independent of other actions related to energy production or conservation.
- Accept the goal of speedy commercialization but choose other target production levels, alternative mixes of production processes, or different levels or types of production incentives (e.g., limit incentives to the loan guarantees of H.R. 3474).

¹ 350,000 barrels per day of oil is about 1.3 percent of 1974 total U.S. consumption of oil and gas.

- Delay decision so as to consider the program in the context of the proposed Energy Independence Authority or other broad energy policies.
- Postpone commercialization and pursue instead further research, development, and demonstration projects relevant to synfuels.

C. Criteria for Decision

To make a decision to proceed with a program of incentives to stimulate synfuel production by private industry, answers to four questions are required: (1) Will synthetic fuel production be justified before 1985?, (2) Does private industry require government incentives to produce them in that time frame?, (3) What is the best package of incentives, considering program objectives and cost?, and (4) Are the costs of that package acceptable in light of the factors that justify synfuel production?

Answers to each of the four fundamental questions depend on a number of considerations.

1. Is Synthetic Fuel Production Needed? The justification of synthetic fuel production between 1975 and 1985 depends on economic and noneconomic factors. Quantifiable economic benefits include the value of the fuels themselves, a degree of embargo protection, and reduced cost of future synfuel production. Unless world oil prices rise substantially above their current levels, the economic costs of synfuel production would probably exceed those economic benefits. However, nonquantifiable and noneconomic considerations could tip the balance either way. Synfuel production capability could provide insurance against large increases in world oil prices and might influence OPEC nations to restrain price increases. A small program strictly limited to acquisition of information on commercial scale processes might be justified even on narrowly economic grounds.

2. Will Private Industry Proceed Without Federal Intervention? It is highly unlikely that private industry will produce significant quantities of synthetic fuels before 1985 without government support. Factors cited include lack of profitability, technological and economic risk, difficulty in raising capital, and constraints imposed by the government. It is clear that some synfuel production would be unprofitable at current oil and gas prices. If profitability were

achieved through use of government incentives, the remaining factors might still discourage investment.

3. What Is The Best Mix Of Incentives? An incentive program should address all significant constraints. The incentives proposed by the President are designed to make synfuel production profitable, to shift some risks from investors and producers to the government, and to alleviate shortages of capital. If these are not the real constraints to synfuels development, a different level and mix of incentives may be appropriate. For example, if risk of capital due to uncertainty about synfuel technology alone is the problem, loan guarantees might be relied on exclusively. If it is not, then loan guarantees might not be sufficient to induce development at the intended scale. An alternative program could include regulatory reform, tax incentives, government ownership, or measures to increase the cost of imported fuels. Although comprehensive evaluation of the costs and effectiveness of alternative incentive packages is beyond the scope of this report, examination of these candidates suggests that a program as effective as and substantially less costly than that proposed by the Administration may be difficult to design.

4. Are The Costs Of The Proposed Incentives Acceptable? A final decision on synfuels commercialization can be made only after an incentive program has been designed and evaluated. Then the costs attributable to the incentives themselves must be added to the previously estimated costs of synfuel production to determine if acquiring synfuel production capacity through government action is justified. Although potentially effective in achieving production targets, the Administration's proposed incentives could reduce competition, increase costs of producing synthetic fuels, and adversely affect private capital markets. However, the alternatives all have similar disadvantages.

D. Other Issues

If a decision to proceed with a commercialization program at some level is made, three other issues -- the production target, the mix of processes to be encouraged, and protection of the environment -- must be considered.

1. A program with a production target of 350,000 barrels per day by 1985 has substantially lower costs than one aiming at 1 million barrels per day, and would provide nearly as much information on technology, process economics, and environmental consequences.

The benefits of synfuel commercialization come in two broad classes -- production of energy and acquisition of information. If information is the primary goal, a program with a target as low as 125,000 barrels per day might be chosen.

2. Alterations in the emphasis given different processes can also alter program costs and benefits. H.R. 3474 provided that up to \$2.5 billion of the \$6 billion in loan guarantees would be used for high-BTU gasification processes,² and that funds may be used for solar, geothermal, and other unconventional processes. The Administration proposal contains no such provisions.

3. Major uncertainties concerning environmental impact cloud the synfuels decision process; their resolution could be an important objective of a small synfuels program. The principal known and potential impacts include large-scale land disruption from oil shale and coal mining, disposal of wastes from oil shale processing, consumption of water in water-short regions, air pollution from processing, potential carcinogen formation in the processes dealing with liquids, and the socioeconomic impacts of the influx of workers, their families, and associated developments on sparsely populated regions. Some such impacts may be mitigated, at the lower levels, by a strict environmental protection strategy (the Administration's proposal contains the outlines of such a strategy) and by grants or loan guarantees to impacted communities. Nevertheless, aggregate impacts of a larger, 1 million barrel per day, level could be severe.

E. Potential Budget Impact

For fiscal year 1976, the Administration requests borrowing authority of \$1.5 billion for loan guarantees and \$1 billion for price guarantees, and appropriation of \$.6 billion for construction grants.

Even if passed immediately, however, a synthetic fuels commercialization program would be unlikely to lead to federal outlays in fiscal year 1976. Rather, the extent and timing of outlays would depend on the program level, the mix of incentives, and the riskiness

2 The BTU, or British Thermal Unit, is a common measure of heat.

of synfuels technologies pursued.

The total budget impact to 2005, when obligations to support prices will have expired, price supports and construction grants implicit in the Administration's 350,000 barrel per day program may range from net revenues of \$2.7 billion to net outlays of \$5.3 billion (in 1975 dollars). During the 1980s annual costs might reach \$250 million per year. Additionally, a maximum of \$2.6 billion in guaranteed loans would be outstanding in 1985. Costs would become higher -- possibly reaching \$26.6 billion over the life of the program -- if a decision were made to proceed to a 1 million barrels per day capacity by 1985.

F. Timing of Decision

If there were a decision to proceed on January 1, 1976, it would be at least the end of 1980 before there could be a year of operating experience with a synfuel plant. But ERDA has several second-generation synfuel processes ready for demonstration which, if successful, could make obsolete a synfuel plant based on current technology. Thus, delay in synfuel commercialization until second-generation process can be included could improve the economics of the program, although information gained about first-generation processes is expected to be useful in the second-generation.

Congress will determine whether an immediate decision is required. It has the option simply to defer decision possibly postponing production targets beyond 1985 -- or to rely upon research, development, and demonstration to lay the groundwork for an expanded synthetic fuel production capability after 1985. Whatever the decision, it should be made in the context of a larger perspective on the proper role of the Federal government with respect to the continuum of energy activities from research through development and demonstration to commercialization.

ENERGY INDEPENDENCE AUTHORITY

ENERGY INDEPENDENCE AUTHORITY BACKGROUND

On October 10, 1975 a bill to establish an Energy Independence Authority (EIA) was introduced in Congress. The EIA, an independent government corporation, would be authorized to provide a wide range of financial assistance to energy projects carried out in the private sector. It would have financial resources of \$100 billion, consisting of a capital stock of \$25 billion subscribed by the U. S. Treasury and borrowing authority of \$75 billion. Only the annual net earnings or losses of the EIA would appear in the U. S. budget. The life of the EIA would be limited to ten years.

Forms of Financial Assistance

The purpose of the EIA is to "supplement and encourage private capital investment to meet the energy needs of the nation." The bill gives EIA broad discretion to choose forms of financial assistance, which could include but are not limited to direct loans, loan guarantees, price guarantees, purchase and leaseback of facilities, and purchase of bonds or stocks of private businesses. The only specific limitation on forms of assistance is the exclusion of grants-in-aid; EIA also may not provide assistance to public entities, including state and local governments or publicly owned utilities.

Fundamentally all forms of assistance provided by the EIA are intended to be repaid. When EIA assumes risks -- for example, when it guarantees prices -- it is required to make arrangements to share as well in the profits of the venture it assists. All loans are to be made on terms which offer reasonable hope of repayment. However, no procedures to ensure that EIA will break even are included in the bill. If they chose, the Board of Directors of the EIA could lose a large part of their assets -- for example, by giving extensive price guarantees at levels above market prices.

Eligible Projects

Within broad limits EIA is also given complete discretion to choose the types of projects it assists. Two general criteria on which projects are to be judged are:

- o significant contribution to energy independence or security of energy supplies
- o inability to obtain adequate financing from other sources at reasonable interest rates.

Projects which may be funded are further limited to those which:

- o employ techniques or processes of energy supply or conservation which are not in widespread domestic commercial use

- o relate to nuclear power
- o involve generation or transmission of electricity from fuels other than oil or natural gas
- o are so large in size as to require assistance
- o involve innovative institutional or regulatory arrangements
- o deal with environmental protection measures needed in connection with energy activities which EIA is authorized to assist.

EIA may not assist projects involving technology in the research and development phase.

Subsidies

Prediction of what an EIA would do is difficult since the Directors retain substantial discretion within the constraints set down in the proposed bill. One general policy the EIA could follow could be to refuse to give any support to a project beyond risk-sharing. Such a stance would exclude any actions committing EIA to providing net subsidies out of its assets -- for example, by guaranteeing prices if the expected level of support is positive. An opposite policy could also be followed -- to subsidize projects to the extent of revenues available from other activities (cross-subsidization) while having no budget costs, or to subsidize so heavily that appropriations would be required to cover the excess of expenditures over revenues.

The choice of policy regarding subsidies is the most critical parameter affecting the choice of projects. No synthetic fuel process which is expected to have production costs higher than market prices could be supported effectively if subsidies were excluded. Indeed, little effective compensation for effects of high interest rates or price controls (FEA or regulatory) is possible without some subsidy.

The extent of cross-subsidization possibly depends on revenues from other projects -- loan guarantee fees, lease payments, interest and dividends from direct investment in stocks and bonds -- and can only be based on arbitrary assumptions about how EIA would act.

Potential Candidates for Assistance

The Federal Energy Administration estimated that about \$580 billion in 1975 dollars will be required to finance investments in energy supply between 1975 and 1984, the proposed lifespan of EIA. Examination of the composition of this \$580 billion worth of potential investments can give some perspective on the kinds of projects EIA would assist.

Almost all of the \$580 billion falls in two broad categories: (1) development, production, and transportation of domestic oil and gas, and (2) generation and transmission of electricity. Capital needs of the oil and gas industry are estimated by FEA to equal \$230 to \$304 billion between

OUTER CONTINENTAL SHELF

5.

1975 and 1985. Capital needs of electric utilities are estimated by the Federal Energy Administration (FEA) at \$215 to \$277 billion during that decade. FEA estimates of capital requirements for coal, synthetic fuels, solar, geothermal, uranium fuel cycle and other energy investments total \$68 billion.

To find the share of these projects which EIA might assist it is necessary to apply the project selection criteria specified in the proposed legislation, which relate to the type of project and need for assistance.

Virtually all the investment projects of electric utilities could be assisted by EIA, under the nuclear power or electricity from sources other than oil and gas clauses, since almost no expansion of oil and gas fired plants is included in the FEA projections. Moreover, absent regulatory reform some electric utilities can make the case that they cannot obtain financing at reasonable terms. Uncertainty about how much of this bill could be paid by EIA arises from uncertainty about the ability of utilities to raise this sum without assistance.

Almost none of the oil and gas investment projects should be eligible. As long as general conditions in financial markets are favorable, almost all analysts see the oil industry as having little difficulty financing any investments it chooses; it uses proven technologies in the

bulk of its endeavors. Although new ideas for exploration and development clearly come along, there is no concern about the industry's inability to adopt them commercially.

A few projects might be large enough to make a claim to assistance. The FEA estimates include additions to the Alaska oil pipeline costing \$3 billion. An Alaska natural gas pipeline could cost \$9 billion.

Putting all these opportunities together, a picture of what EIA might do emerges. If EIA pursues a policy of subsidizing projects which cannot earn an adequate profit at current market prices, it could support up to \$20 billion of investment in synthetic fuels and perhaps \$5 billion investment in solar and geothermal energy. It appears unlikely that financing difficulties will affect more than \$20 billion of energy investment (exclusive of investment by electric utilities) which would otherwise be profitable. The remainder of EIA's assets would presumably go to financial support of electric utilities.

Liquidation of EIA

EIA is designed to liquidate itself at the end of ten years, or, if an extension is granted by the President, thirteen. No new financial commitments are permitted after the first seven years. The Liquidation Plan is to be drawn up by the corporation itself, and no insight into the nature

of the liquidation is provided in the bill or fact sheet.

Liquidation can be accomplished by only two means: sale of assets to private investors, or transfer of assets, obligations and functions to the Secretary of the Treasury. Extended life is the essence of an investment: it is a commitment now of resources which will earn income over many future years. If loan guarantees and price supports are to be effective in inducing investment in a project with a life of ten or more years, they in most cases remain in effect after EIA is liquidated. The agencies which will assume these functions must have budget authority to pay price supports and redeem defaulted loans. To the extent that the often repeated claim that private investors discount loan guarantees which must wait for appropriation to be redeemed, is valid, the termination of EIA and transfers to agencies which do not now have borrowing authority will reduce the effectiveness of loan guarantees.

Purchase and lease-back of facilities also involves physical plant and equipment which will endure beyond the life of the EIA.

Direct loans and stock purchases of EIA can be either transferred to the Secretary of the Treasury or sold back in the private capital markets. In one case the EIA remains alive in all but name; in the other, financing which EIA

supported in 1975 to 1982 will be shouldered by private markets in 1982 and beyond, in addition to investments newly made in those years. The portion of EIA financing which goes into stocks and bonds will, if effective in inducing new investment, simply postpone the time at which that financing must come from private markets -- and the government will probably have to sell its investment at a loss. (Otherwise, private markets would have provided the funds initially). Is 1982-? a period of easier money, or 1975 to 1982 a unique time in the energy sector, so that this costly shift is justified.

The choice may be between using EIA to make commitments which will then be assumed by the Secretary of the Treasury, incurring budget costs and imposing large burdens on private capital markets between 1982 and 1988, or choosing only projects which need assistance for seven years or less.

OUTER CONTINENTAL SHELF

GULF OF ALASKA SALE

	<u>\$ BILLION</u>
INTERIOR ESTIMATE	0.5 - 1.0
CEO ESTIMATE	0.2 - 0.6

MAJOR UNCERTAINTIES:

LITIGATION

OPERATING COSTS

PRICES OF OIL

TRANSITION QUARTER PROJECTIONS\$ BILLION

LEASE SALE RECEIPTS

MID ATLANTIC

0.4 to 0.6

ROYALTIES

0.1

TOTAL

0.5 to 0.7MAJOR UNCERTAINTIES:

TIME AND EXTENT OF SALE

INTRODUCTION AND SUMMARY

Receipts from periodic auctions of leases of Federal Outer Continental Shelf (OCS) lands for oil and gas exploration and production are credited against outlays in the Federal budget (function 953). Such receipts are in the order of billions of dollars per year. Thus the accurate estimation of such receipts is important in determining the size of the overall budget deficit, or, put another way, as a means of determining funds available for additional programs within a fixed fiscal policy.

OCS receipts depend primarily on the rate at which acreage is leased, and on the value which bidders place on the resources they contain. Thus, for any fixed leasing schedule, receipts are not a policy variable.

Yet estimates of receipts vary widely, and actual receipts differ importantly from early estimates. Substantial real and unresolvable uncertainties make estimates extremely conjectural. Uncertainties are due to two main factors: schedules of when lease sales will be held, and the value (and amount) of land offered for sale.

Most future lease sales are scheduled in areas in which no oil production has yet occurred. These areas are called "frontier" areas, and sales scheduled for them have frequently been delayed for a variety of reasons, including procedural delays, administrative problems and litigation. Because the amount of oil which can be recovered is unknown, the problems of extracting it often unevaluated, and the future economic climate uncertain, it is very difficult to forecast with any precision the value of leases offered for bids. In the recent sale off of Southern California, many analysts over-estimated the value by

a factor of from two to five.

As part of its support for the House and Senate Budget Committees in preparation for the First Concurrent Resolution on the Budget for FY 1977, CBO has prepared this analysis of OCS receipts. This analysis (1) describes the factors which influence OCS receipts, (2) develops a range of estimates of receipts for Fiscal Years 1976 through 1981, (3) compares these estimates with several prepared by various groups in the last year, and (4) provides details of a sample calculation.

The table below projects a reasonable range of total receipts (including royalties and lease rents, as well as the [dominant] lease bonuses). If in some cases, such as FY 1978, the range appears very large, it is an honest reflection of the uncertainties involved, both regarding the number of sales scheduled within the year, and the value of each sale.

	<u>FY76</u>	<u>TQ</u>	<u>FY77</u>	<u>78</u>	<u>79</u>	<u>80</u>	<u>81</u>
High Probability Range	2.2-2.8	.5-.7	2.8-4.2	4.0-5.7	2.3-2.9	1.7-2.5	1.6-2.2
High Limit	3.2	1.3	7.8	6.6	N/A	N/A	N/A
Low Limit	2.2	0.3	1.8	2.4	1.3	1.6	1.5

The High Probability Range is derived from what is considered to be a range of reasonable scenarios of potentially likely events given present pricing policies and knowledge of reserves and costs. Clearly these projections should be reevaluated in the event of any major policy change or if, say, a major producing area is discovered.

REVIEW OF THE PRESIDENT'S ENERGY BUDGET FOR FISCAL YEAR 1977

MONDAY, MARCH 15, 1976

U.S. SENATE,
TASK FORCE ON ENERGY,
COMMITTEE ON THE BUDGET,
Washington, D.C.

The task force met, pursuant to notice, at 10:10 a.m., in room 357, Russell Senate Office Building, Hon. Frank E. Moss (chairman of the task force) presiding.

Present: Senators Moss, Bellmon, Beall, Buckley, and Domenici.
Staff members present: Lewis J. Ashley, task force coordinator; and Terence Finn, counsel, and Daniel Twomey, counsel, full committee. Senator Moss. The hearing will come to order.

OPENING STATEMENT OF SENATOR MOSS

We are very pleased to have this hearing on the President's Energy Budget for fiscal 1977. We use a seminar format in these hearings and try to keep them very informal. We concentrate on getting information via questions and answers and the give-and-take it affords rather than depending primarily on lengthily prepared statements. Let me attempt to set the stage.

For several weeks, this committee has been holding hearings to develop the first concurrent resolution on the fiscal 1977 budget which the committee must report to the Senate by April 15. Earlier hearings have dealt with a variety of other important issues. Today, we focus on the President's fiscal year 1977 energy budget.

PROGRESS OF UNITED STATES DEPENDS ON ENERGY

There is an inescapable relationship between the economy, the energy situation, and the budget. Energy is the lifeblood of the U.S. economy. Economic progress depends on the price and availability of energy. The future of the United States depends in large part on the policies which the Congress will adopt concerning energy.

BUDGETARY IMPORTANCE

No issue is likely to have greater budgetary importance in the years ahead than energy. Its impact on spending, revenues, taxes, and on the general goals of fiscal policy are of great importance. Therefore, the task force seeks to determine the economic and budgetary implications of the administration's fiscal year 1977 energy proposals.

ENERGY: IMPORTANCE FAR EXCEEDS OUTLAYS

At present, outlays for energy approximate 1 percent of the Federal budget. This is in contrast to interest payments which represent about 8 percent and grants to States and local governments which comprise

about 15 percent of the Federal budget. If the President's proposals are approved, energy will become a larger budget item. Even so, the importance of energy far exceeds its relatively small part of the budget.

ENERGY PROPOSALS—DESERVE CAREFUL CONSIDERATION

Although the President's energy proposals do not appear to involve a significant increase in expenditures initially, they may require a considerable future investment of the public's money. They deserve careful consideration for this reason and also because many of the proposals represent new and somewhat dramatic departures from past practices, and carry significant contingent future budget liabilities. How much is not clear. But I believe the Budget Committee has a mandate to provide a clear picture as to the full budgetary impacts.

POLICY QUESTIONS HAVING BUDGETARY IMPACT

Among the key policy questions which have budgetary impact and with which the committee is concerned are:

Does the administration have a blueprint for an overall energy program? What are the goals and priorities? Attaining our energy objectives is not just a matter of spending more money, it is also a matter of the right policies and priorities. Which ones will provide the most beneficial energy response? Does approval of the President's fiscal year 1977 budget represent any major commitment to particular energy fuels or programs? What are the key decision points in the major fuel areas—solar, geothermal, synthetics, fossil, and nuclear—over the next 5 years?

How much are we going to have to spend to develop sufficient energy supplies in the future? What are the long range budget implications of Federal investments in new technologies like solar power, nuclear fusion, synthetic fuels, et cetera?

What are the pros and cons of financing the energy proposals via off budget or on budget? Off-budget arrangements have the appearance of holding down the size of the Federal budget, but are there any real advantages to this concept? Why and for what energy projects is Government financial assistance required? What are the relative advantages of the type financing proposed—for example, loans, loan guarantees, price supports, tax expenditures, and direct spending—and how much of each is required?

To what extent is Congress' control over the energy program and Federal spending affected by off-budget financing?

What is the rationale for the administration's proposal to increase reliance on the public sector by creating a new Federal energy agency—EIA—with plans for considerable financial resources to intervene in the private sector. Is it consistent with the administration's proclaimed goal of reducing the size of Government and drawing on the strength of the private sector? If this proposal is adopted, what will be the impact on the private sector of such large, Federal, financing projects? What happens if EIA is not approved by the Congress?

What will it cost to implement the Energy Policy and Conserva-

tion Act (EPCA) enacted in December? The President's fiscal year 1977 budget proposal did not request funds for EPCA. How will it be funded, and in what time period?

Does our energy R. & D. budget reflect the right priorities between nuclear and nonnuclear R. & D.? Are we supporting the right mix of technologies overall? Does the nuclear R. & D. effort provide proper emphasis on waste management, fuel reprocessing, and safeguards against thefts of nuclear materials? If the anti-nuclear opinion succeeds in setting back nuclear development, what alternatives does the administration have in mind?

What emphasis does this budget place on conservation? Apart from R. & D. what specific programs are proposed?

What are the risks versus the expected gains in allowing private industry to enter the uranium enrichment business?

What are the estimates of receipts from various revenue sources such as TVA power sales, OCS leasing, and oil sales from the naval reserve. What is the likelihood of achieving these estimates and how will the budget and the deficit be affected if the receipts fall short?

ROLE OF BUDGET COMMITTEE

I believe this committee can play a special role in analyzing the budgetary and macroeconomic consequences of the President's fiscal year 1977 energy budget in order to aid the Congress in making the right choices.

Does the Senator from Oklahoma have any opening remarks?

Senator BELLMON. I have no opening remarks, I would like to welcome the witnesses this morning.

Senator Moss. The Senator from New York.

Senator BUCKLEY. I have no comments, but I welcome the witnesses.

Senator Moss. We are pleased to have Mr. Zausner and Dr. Seamans here as our witnesses to testify this morning. In keeping with our usual practice, we will ask the gentlemen to present their opening statements in as limited a period as they can in order to give us as much time as possible for questions and exchange of information.

Mr. Zausner will you begin.

STATEMENT OF ERIC R. ZAUSNER, DEPUTY ADMINISTRATOR, FEDERAL ENERGY ADMINISTRATION, ACCOMPANIED BY WILLIAM G. ROSENBERG, ASSISTANT ADMINISTRATOR, ENERGY RESOURCE DEVELOPMENT; AND ERNEST E. SALISBURY, JR., ACTING ASSOCIATE ASSISTANT ADMINISTRATOR FOR FINANCIAL MANAGEMENT, FEA, AND MARTIN D. HOWELL, DEPUTY ASSISTANT ADMINISTRATOR, MANAGEMENT AND ADMINISTRATION, FEA

Mr. ZAUSNER. I would like to submit my statement for the record¹ and hit a couple of key points and then turn it over to Dr. Seamans.

I think I can address some of your questions as I go through this.

As you know, FEA and ERDA are the two primary line energy agencies. We were formed during the embargo with a very limited function at that time, which was running the allocation and price controls and dealing with that embargo.

¹ See Mr. Zausner's prepared statement, p. 124.

NATIONAL ENERGY PROGRAM

It really wasn't until January of 1975, when the President, as you discussed, set out a National Energy Program, and it would be worth a minute looking at that.

He set three goals. It was our feeling that our dependence was much too great now, and if it got worse in the next few years, the consequences would be unacceptable.

REDUCE VULNERABILITY TO ZERO

His second goal was by 1985 to reduce our vulnerability to an embargo to zero. That doesn't mean zero imports, but it means an important level low enough so that if we had an embargo, through emergency measures and other steps we could buffer the economy completely from any impact.

INCREASE DEVELOPMENT OF NEW TECHNOLOGIES

Third, in the post-1985 period, to make sure that our development of new technologies was such that they could play a major role in meeting world energy needs, as an alternative, if you will, to Middle East oil. To implement that program in 1975 he put forth the Omnibus Energy bill. It had 13 titles, strategic reserves plus a number of other things.

In the interim, since January 1975, he also proposed a limited number of new legislative proposals, primarily the Energy Independence Authority which you referred to, emergency measures to deal with the national gas shortage and a new impact assistance program.

This January, he proposed—February, actually—one further new initiative, which was legislation to speed the decision on bringing Alaskan gas from the North Slope down to the Lower 48 States.

ENERGY POLICY AND CONSERVATION ACT

At the time we prepared the 1977 budget none of that legislation was enacted, and in fact the President had requested an immediate phase-out. The result is that the 1977 budget originally submitted assumed a complete phaseout within 1977 of all of our allocation and price controls, and does not take account of the legislation which was enacted in the EPCA, the Energy Policy and Conservation Act.

We had a very good feel of what the budget implications were for the proposals we submitted, and in fact they were included in the 1977 budget. What we did not have, however, was a very good feel for what was finally resulting from the Congress, and in many ways that differed substantially from what the President proposed, but as you know, in a spirit of compromise, we signed that bill and we are now preparing both an amendment to the 1976 budget and the supplemental for 1976, and the 1977 amendment to take account of the EPCA.

FOUR OF PRESIDENT'S THIRTEEN TITLES PASSED

I might add in terms of where we stand that the EPCA which was passed included 4 of the President's original 13 titles—the Coal

Conversion Authority, the ability to convert powerplants in oil and gas to coal, appliance labeling, a phaseout of controls, of oil price and allocation controls, a strategic reserve system, which is in a different form but still one of the President's original proposals, and standby authorities to implement in time of another embargo.

When we look at that legislation now for its budget impacts for 1977, it is clear it will be appreciably greater than what is in the 1976 budget. I would like to touch on the areas that cause that to be so.

STRATEGIC STORAGE SYSTEM

First, with respect to the strategic storage system, as you recall, the President's legislation authorized up to a billion barrels of storage, but set no deadlines for its achievement. The legislation which the Congress reported out was dramatically different with respect to strategic reserves, and this is important for 1977, as it mandated 150 million barrels of oil in storage by the end of 1978.

So in effect, compared to what the President had in his original budget, it essentially forced a lot of the authorities and obligations much earlier in the process than we had originally envisioned.

To meet the congressionally mandated timetable we will need funds in 1976 that we will have to spend, as well as a major increase in 1977.

Just to give you an order of magnitude, and I recognize your problem in trying to put through the resolution, but we are still going through the process with OMB, actually developing the numbers. I would give you rough orders of magnitude, and I would hope in a week or two we would be submitting details. For your planning purposes, I can give you a few.

POLICY DECISIONS AFFECT OUTLAY

The reason I am reluctant to give you anything specific is that there are policy decisions that will affect the outlay.

First, the legislation allows us to mandate an industrial storage program, to require industry directly to carry some of the increased capacity, or, alternatively, to have the Federal Government build the whole system.

Well, to the extent we mandate the industry we do it, of course, it will be reflected in consumer bills, whereas if we build the system for the Government, we will need the budget and dollars to do it directly.

COST OF OIL

There is also a question of the price we will pay for the oil. We have a range of possibilities from buying that oil on the market to in fact allocating it into the system either at the national average price, and perhaps from some royalty oil, and those prices are \$5, \$6, \$7, or \$8 a barrel, rather than \$14. There are unresolved legal questions, but they have a dramatic effect on the budget, when you talk about 150 million barrels of oil and a potential difference of \$4 or \$5.

In 1977, to meet the 150-million-barrel target by 1978, we will need authority of probably close to \$1 billion on top of what is in the 1977 budget. That is perhaps the major increase over what is in the President's 1977 budget.

ENERGY CONSERVATION

There were two other areas, however, which will require much more modest increases not in the budget. First, with respect to energy conservation, EPCA through its appliance labeling, and also a State grant program, a \$550 million State grant program, levies new requirements on FEA which we will have to be asking for funds to implement in 1977.

PHASEOUT OF PRICE AND ALLOCATION CONTROLS

Second, unlike the President's budget, which expected a very rapid phaseout of price and allocation controls, as you know, this is a 40-month program under the EPCA, so we will have to request additional funds for people and contracts and the like, for compliance and enforcement and other programs to essentially continue the price and allocations controls, at least through 1977, and obviously somewhat longer.

So those are the other two areas which will largely require increases above what is in the current budget. They are on the order of magnitude of a few hundred billion dollars, nowhere near as large as strategic reserve system.

OTHER LEGISLATION CLOSE TO ENACTMENT

Those are in effect the major changes in the 1977 budget, based on what is now implemented. However, there are several other pieces of legislation which the President proposed, which are relatively close to enactment which could also affect these numbers, and if I could I would spend a minute on those.

NAVAL PETROLEUM RESERVE

The naval petroleum reserve, I think the Congress has agreed on details of that bill, and we would expect that bill to be signed perhaps within 2 or 3 weeks.

MANDATORY STANDARDS FOR NEW BUILDINGS

Also, as I understand it, the President's program for mandatory standards for new buildings, and also this program of grants to low-income people to help them install insulation, are also relatively close to enactment, and in one version or another have passed both the House and the Senate.

INSULATION TAX CREDIT

Finally, we had proposed an insulation tax credit which would provide that 15 percent of the capital costs that a homeowner spent in his home could be written off against his income taxes.

That had passed the House almost a year ago when the Ways and Means Committee held hearings and passed the omnibus energy tax bill, and since then there has been no action, but I would think that there is a fair likelihood that that piece of legislation also has a possibility of passing quickly.

I think those are the main areas of additional budget impact of things which I would like to hope would be passed relatively quickly.

ENERGY INDEPENDENCE AUTHORITY

You mentioned, and I guess I ought to touch on it just a minute, the question of the Energy Independence Authority, and you raised several questions about it. Maybe I could take a minute to discuss that, and then turn it over to Dr. Seamans.

EIA, as you probably know, is a corporation, a new Federal corporation, to essentially provide financial assistance to a very limited category of projects which we think are very critical to energy independence and which, to the best of our understanding, are likely not to be financed without Federal assistance.

These are several types. New technologies, and you mentioned some of the categories, but we believe the technologies, while they can come over the research bench and have a possibility of being commercial, that until the first or the second plant is built and operated for some period of time, the risks are very large and private companies may be very unwilling to undertake those risks.

Second, projects which are very large—for example, some of these new pipelines that are being considered—or nuclear or energy parks are so large that it is not likely that the private sector can muster enough capital in one place to finance them.

Let me talk for a minute about how we set it up. When we talk about \$100 billion corporation, that is \$100 billion of projects which we expect EIA over its 10-year life might in fact have to finance. It in no way represents \$100 billion of flows, or exacted costs by the Federal Government to support those facilities.

If I can give you a simple example, a price guarantee on one synthetic fuel plant might represent a guarantee that would be \$1 billion over the life of the project. Is it not likely that the Federal Government would have to put up \$1 billion? It might be the differences between the guarantee and a lower world price.

With respect to loan guarantees, while the EIA might guarantee a half a billion loan, that would count against the \$100 billion, the likelihood is that on very few of those would the Government be forced to foreclose or in fact pay up.

So we see the Federal exposure as substantially less than \$100 billion.

This gets to the why off-budget, and why did we set the corporation up the way we did.

If we were to put the EIA on-budget, as I understand it, it would work almost on a cash basis. If the EIA agreed to underwrite or guarantee a loan of half a billion dollars, that would show up on budget as a half a billion dollar outlay, if you will, in the year that was done, or at least the commitment.

Our problem is that we see EIA having a limited life, 10 years by law, and by balance we don't expect it to lose money, and while it may be making commitments in terms of price guarantees or loan guarantees or whatever, we would total up to \$100 billion; its outlays and losses will be less than that.

CONGRESSIONAL CONTROL

The way we have tried to design it is to take its operating expenses and a reserve for losses and put those on budget, so that the money the corporation actually loses would be shown on the budget, but you also asked a question about congressional control.

The way we tried to deal with that is, we restricted the corporation in that of the hundred billion of the total projects it can finance, it has to have \$75 billion of debts and \$25 billion of equity. We said in no case can the corporation's losses or expected losses ever exceed its equity, or \$25 billion, and that the whole \$25 billion of equity should be subject to the appropriations process.

The concept was that in the more risky projects, where there really was a significant chance of loss, that the Congress as well as the executive branch ought to have the ability to review the transaction with the corporation.

So all of its equity money will have to be appropriated by the Congress, and this would provide the opportunity for the Congress to review its projects, look at the risks, and to the extent those appropriations were not provided for the equity, or if in any given year the expected losses of the corporation exceeded the amount of equity already appropriated, then the corporation would be precluded from entering into new commitments for new projects.

So we tried to build in a specific control mechanism tied to the losses of the corporation which would be held to the equity portion, and that equity portion would have to be appropriated by the Congress. That was, in effect, the mechanism we used to provide congressional review.

Senator Moss. It would be appropriated, but would be totally off budget?

Mr. ZAUSNER. Yes, but each year, the actual expenses of the corporation, based on an independent audit by an outside accounting firm which would look at all the corporation's commitments and would set up a research for losses at whatever that independent audit showed was the expected loss of the corporation, that, in fact, would be on the budget in the year that that audit was completed.

So there would be a budget item which would take account of the losses the corporation is expected to incur, real, or only expected.

I think with that background, Mr. Chairman, I would defer to Dr. Seamans.

Senator Moss. Thank you very much. Your statement raises a number of questions, but I would like to have Dr. Seamans give his statement and then we can question both of you.

[Prepared statement of Eric R. Zausner follows:]

PREPARED STATEMENT OF THE HONORABLE ERIC R. ZAUSNER, DEPUTY ADMINISTRATOR, FEDERAL ENERGY ADMINISTRATION

Mr. Chairman and members of the committee, I appreciate the opportunity to review with you the current status of the Administration's National Energy Program. Since the 1973-1974 embargo, we have sharpened our understanding of the dilemma which confronts us, but we still have a long way to go before solving all energy problems.

The newly enacted Energy Policy and Conservation Act (EPCA) is a step in the right direction, but as the President said when he signed the bill, it does not provide all the essential measures the Nation needs to achieve energy independence as quickly as he would like. He further indicated that the single most impor-

tant energy objective for the United States today is to resolve our internal differences and put ourselves on the road toward energy independence. The legislation is by no means perfect.

There were three main reasons why the President signed this bill:

1. It will enable the country to meet a significant portion of the mid-term goals for energy independence which were laid out in his State of the Union Message last year;

2. The major provisions of the new bill, properly implemented, will permit gradual phasing out of controls on domestic oil over the next 40 months, and in practical terms; and

3. It is the most constructive bill which the Administration and Congress were likely to work out at this time.

Before discussing the EPCA, I believe it would be useful to briefly review how our energy program has evolved over the past two years. Then I would like to discuss the budget implications of the EPCA and other legislation currently pending in Congress.

I. PRIOR FEA FUNCTIONS

The crisis nature of the energy situation during the 1973-1974 embargo delayed early development of a comprehensive national energy program. In the period immediately following the embargo, our energy management programs were primarily regulatory in nature, overseeing the distribution and pricing of limited energy supplies throughout the Nation.

During this early phase, Congress supported these initial efforts through the passage of interim legislation which included the Emergency Petroleum Allocation Act, the Federal Energy Administration Act, and the Energy Supply and Environmental Coordination Act. Although each of these laws addressed a specific energy program requirement, none by itself, nor the combination of them all, provided a comprehensive approach to the energy problem. At that time, both Congress and the Administration recognized the crucial need to develop an in-depth understanding of the domestic and international energy situation before we could develop an effective national program to limit future energy vulnerability. First, we had to establish a comprehensive information data base composed of the supply, demand, production and import statistics that would form the foundation for techniques to forecast our energy future. Using econometric models, FEA developed the Project Independence Report in 1974 that explained the impacts of different policy strategies on the future energy situation.

Using the analyses of the Project Independence Report, an overall energy management program was developed by the Administration and submitted to the Congress in January, 1975, as the "Energy Independence Act of 1975." The program included thirteen specific initiatives for either conserving energy or increasing our domestic resources.

In the past year, during which these proposals were being considered by Congressional committees and the details of the comprehensive legislative package clarified, the Federal Energy Administration operated under its enabling legislation. Although we continued the important fuel pricing and allocation programs, we placed major emphasis on reaching solutions to our energy problem. FEA's role in development of a national energy policy was reinforced through the President's Energy Resources Council (ERC), the development of economic and inflationary impact analyses of all Federal program proposals with energy implications, and the evaluation of numerous pieces of proposed energy legislation. With an ever-expanding national energy awareness, the FEA was requested to provide technical information to Congressional committees, State and local governments, industry, and various concerned professional and civic groups throughout the country.

To support our International Energy Program commitments, FEA provided program support and representation at meetings of the International Energy Agency and separate international energy and economic conferences.

In the energy conservation area, FEA vigorously pursued programs to provide conservation information to the public, to demonstrate residential conservation techniques, to show commercial and industrial energy users how they could reduce operating costs through energy saving actions, and to inform citizens about the comparative efficiency of new cars and how to use existing transportation resources more efficiently by carpooling and vanpooling.

To reduce our dependence on foreign oil sources, we utilized the authorities of the ESECA to order the conversion of utilities from oil and natural gas to coal power sources where environmentally safe. We initiated an evaluation of

Federal and State regulations to identify bureaucratic bottlenecks hindering efficient electrical power generation. Because of the long lead times necessary to construct and bring into operation new utility plants, FEA has concentrated considerable attention on this sector. Many of these studies contributed to the pool of information gathered by the ERC Task Force on Power Plant Acceleration with FEA taking the lead.

Finally, because of the potential severity of natural gas shortfalls for the winter of 1975-1976, the Energy Resources Council established within FEA a task force to thoroughly analyze the situation and to recommend various legislative and administrative initiatives to meet the problem.

II. FUTURE FEA FUNCTIONS

A. *The role of EPCA*

As noted previously, the recently enacted Energy Policy and Conservation Act (EPCA) will now determine much of the program activities and future direction of the Federal Energy Administration. The EPCA establishes national policies on oil price and allocation controls, conservation measures, supply initiatives, and emergency authorities such as contingency planning for protection against another embargo. Specific provisions of the Act include:

1. Standby authorities enabling the President to implement rationing and mandatory conservation plans to meet our domestic needs and international energy commitments during a future supply interruption;

2. The creation of a Strategic Petroleum Reserve to offset the impact of a supply cut-off;

3. Provision for loan guarantees to develop new underground coal mines;

4. Ceiling prices on domestic oil, while providing for incentives to stimulate certain types of oil production;

5. Conservation of energy through voluntary and mandatory programs applicable to industry, the States and the Federal government;

6. Energy efficiency standards for automobiles, and energy efficiency targets for appliances and other consumer products; and

7. Expansion of the ESECA coal conversion program to reduce our demand for natural gas and petroleum products.

By combining the 40-month pricing schedule, conservation and resource development provisions and the existing programmatic scenarios of the Project Independence Evaluation System, we will be able to quantify those energy requirements that still stand between the Nation and its goal of independence by 1985. Using the EPCA as our program base, we will work with the State governments and private sectors to continue to develop and expand programs to bring us closer to success.

At this moment, our greatest emphasis must be on the aggressive implementation and management of the programs mandated by the EPCA. The Act provides a variety of mechanisms to accomplish its objectives. For example, there is a mandatory requirement for reporting by the private sector on industrial conservation achievements. Technical experts within the Federal government will prepare energy efficiency test procedures in order to label appliances so that consumers will have an objective basis for comparison. Individual States have the responsibility for administering those conservation programs best handled at that level.

This decentralization of effort will allow each objective to be accomplished with the best available technical information and financial resources.

In the coming year, we will give special priority to the Strategic Reserve Program (including plans to develop Naval Petroleum Reserve No. 4 in Alaska), expanding the conversion of utility generators burning oil or gas to coal, and developing the Coal Loan Guarantee Program. We will continue to give attention to specific regional problems, such as the Northern Tier States as they experience the reduction in Canadian fuel supplies.

Our two years of experience in pricing and allocation regulations will help in managing the price control formula for the remainder of the period. In accordance with clear legislative direction, all proposed pricing regulations will be analyzed for administrative feasibility, effects on crude oil production and for regional, social and economic impacts before issuance. We will also take every precaution to insure that our regulations are consistent with the continued economic recovery of the Nation.

Finally, to insure that the Nation will not find itself again vulnerable to foreign petroleum supply disruptions, the FEA is responsible for developing a revitalized contingency planning program. The EPCA specifically requires the submission to

Congress of contingency plans for rationing and mandatory conservation strategies for use during an emergency. Depending upon the timing and length of an interruption, plans must be both economically and socially feasible for actual implementation at all points in time. Our Project Independence analyses will prove invaluable in this area.

The EPCA has given the Federal Energy Administration, other Federal agencies, State governments and the private sector a clear mandate and requirement for energy program action in 1976 and the coming years. FEA has a clear responsibility to provide effective leadership in the implementation of these programs. Our fiscal year 1977 budget request, when amended, will reflect our emphasis on effective implementation of this legislation.

B. Future initiatives

As the economy continues to move into recovery, the demand for energy resources will continue to grow. We cannot afford to let this new demand be supplied by foreign markets. Therefore, we will continue to ask Congress to support additional energy supply and conservation legislation which will enable the United States to put a lid on energy resource imports while the economy grows. The EPCT only incorporates four of the original titles contained in the President's Omnibus Energy Bill. I would like to briefly address those areas for which we will be requesting action.

The fall and winter seasons this year have been mild enough to mitigate widely predicted shortages of natural gas. Even so, the fact remains that we will consume more natural gas this year than we will discover. In the long term, the price of natural gas must reflect its true worth as a fuel, taking into account its scarcity and the demand for it. The removal of Federal price controls in the interstate market for natural gas will be a high priority objective for the coming year in order to stimulate both exploration and production of that depleting resource.

To change our mix of energy sources away from oil, the United States will have no choice but to make greater use of alternate energy sources available in this country in abundance—coal and nuclear power. In the next ten years, the limiting factors for coal use will not be its availability, but demand. One reason that coal lost its share of the fuels market in the last 15 years was the passage of legislation requiring the reduction of air pollutants, especially of the sulfur dioxide produced by burning coal. This requires large capital expenditures by coal users to meet air quality standards. To allow increased utilization of coal, the Administration will continue to work for a modification of our present laws and regulations, especially certain Clean Air Act Amendments.

The primary demand for coal comes from the electric utility industry. The continued provision of adequate generating capacity is a high priority subject for FEA investigation. This is doubly true because generating plants can often use either domestically available coal or nuclear fuels instead of oil, and because electricity can be used in homes and businesses to displace the end use of imported petroleum products. We will continue to work toward electric utility rate structure reforms to encourage a more efficient use of plant capacity.

Nuclear energy has many advantages for electrical generation. Unfortunately, some regulatory actions by the local, State and Federal governments cause excessive delays in bringing nuclear plants on line. FEA is actively considering the merits of a comprehensive system by which all identical regulatory procedures may be handled at one time. This will reduce the lead times for licensing and the final costs of construction which are inflated by lengthy delays.

The Administration will also seek to expedite the construction of energy production facilities by projecting the regional needs for such facilities and seeking out land areas that would be suitable for such construction. Legislation has been proposed which will allow the Federal Government to join with the States to streamline planning and regulatory action for future facilities.

The Administration continues to urge passage of legislation authorizing production of the Naval Petroleum Reserves. Revenues from the sale or exchange of oil from the Reserves are necessary for continued exploration and development of the reserves, and for the financing of the Strategic Petroleum Reserve Program.

The Administration will continue to seek some new initiatives in the conservation field. First, in conjunction with other appropriate government agencies, standards will be sought for the thermal efficiency of all new buildings. This action will produce energy payoffs on an expanding basis from now to the turn of the century. In conjunction with this program, funds will be sought to aid the poor and elderly to insulate their homes.

In sum, programs are needed which will encourage private industry to use more of the fuels which we have domestically available. Incentives will be needed to induce the capital investments which will produce and save energy. The Administration will push for these incentives in the coming year.

III. ENERGY INDEPENDENCE AUTHORITY

I would now like to turn to the Energy Independence Authority, and discuss some budgetary issues which I believe are of interest to this committee.

The funding authorization sought for EIA is \$100 billion, consisting of \$75 billion in borrowing authority and \$25 billion in capital stock. In fiscal year 1977, the initial increment requested of EIA's \$25 billion of capital stock would be \$8 billion, which should suffice for several years to meet possible investment requirements.

EIA's authorization to borrow up to \$75 billion during the period in which it makes commitments is subject to the prior concurrence of the Secretary of the Treasury with respect to method, source, interest, timing and other terms of any debt issues.

EIA's capital stock of \$25 billion is subject to the Congressional appropriations process, because of the higher-risk inherent in the intended use of these funds.

One of the basic premises of the EIA is that it should be a self-liquidating venture with a legislated life of ten years. New financial commitments could be made during its first seven years of existence. The ten year life limit may be extended for an additional three years to facilitate the orderly liquidation of the authority's portfolio and commitments.

In addition, although some of EIA's investments will support high-risk ventures such as synthetic fuel development, in the aggregate it is expected that all of the financial resources committed through the EIA will be recovered by the U.S. Government. Thus, the impact of EIA upon the Federal budget is better measured in terms of its annual net gains and losses from operations, rather than in terms of total outlays and commitments, since all of these are to be ultimately recovered as revenues in the form of earnings, interest, dividends, fees, capital gains and the like.

Under this treatment, the estimated impact on the fiscal year 1977 budget is a net loss of \$42 million, resulting from estimated expenses of \$83 million and revenues of \$41 million. The \$42 million loss is included as part of the fiscal year 1977 budgets totals. In addition to this, an obligation of \$10 million in dividends payable to the Treasury on EIA's paid-in capital is accrued in that year, and carried forward; interest on this accrual is paid by EIA as operating expense during Fiscal Year 1977.

EIA's projected net loss position in fiscal year 1977, and in the early years of its ten year life span, stems primarily from some conservative assumptions about EIA cash flow. In particular, operating expenses for administration build up rapidly, to a total of \$35 million at the end of fiscal year 1977, supporting a staff of 600. The level of staff and expenses is in line with experience of entities such as the Export-Import Bank, which is comparable to EIA in the nature of its activities. No dividend or capital gain returns are assumed from EIA's equity outlays, on the premise that ventures in which EIA takes a direct participation will need to protect their cash position in the near term. Finally, a two percent allowance for defaults on loans and loan guarantees has been assumed from the beginning of EIA's operations. Without the creation of this reserve, EIA would show a cash surplus from operations beginning in fiscal year 1978. However, we believe that an allowance for future defaults should be included as an operating outlay on a current, yearly basis, to present as fairly as possible the estimated impact of EIA's activities upon the Federal budget.

The \$75 billion in borrowing authority would cover EIA's total borrowing resources; the full authority is requested at the outset of EIA's planned ten year life span because it is anticipated that this part of EIA's overall resources will be committed to the lower-risk ventures in EIA's portfolio. The \$25 billion of equity, on the other hand, is for the purpose of allowing financing of higher risk projects.

Interim operations for EIA are included in the annexed portion of the Federal budget. The impact of these outlays upon EIA's operating income is shown as an adjustment to the Federal budget.

IV. NAVAL PETROLEUM RESERVE LEGISLATION

In the Energy Independence Act of 1975, the President proposed full exploration, development and production of the Naval Petroleum Reserves. Such actions are considered essential to implement the Strategic Petroleum Reserve provided for in the Energy Policy and Conservation Act, and to increase our domestic supplies of petroleum. NPR production, primarily from Elk Hills, California, which could produce 200,000-300,000 barrels per day, is the most significant source of increased domestic supply in the near term. West Coast consumers would primarily benefit from these supplies.

The House of Representatives, this past summer, adopted the provisions of H.R. 49 which would transfer jurisdiction of the reserves from the Department of the Navy to the Department of the Interior. It would authorize full production of NPR's 1, 2 and 3, but only exploration of NPR-4 in Alaska. Any development or production from the Alaskan reserve would require further authorization from Congress.

At about the same time that the House was acting, the Senate passed its own NPR legislation, S. 2173, which would retain jurisdiction of the reserves with the Navy, but would limit NPR 1, 2 and 3 production to 350,000 barrels a day for a five-year period. As with the House, Alaska NPR-4 development or production was not authorized. Both House and Senate bills would establish a Special Fund, similar to the President's proposal which would finance NPR exploration, development and production, as well as implementation of the Strategic Storage Program.

The House and Senate agreed to a Conference, which met in December and then recessed for Christmas. It is my understanding that the Conference was to meet yesterday to resolve some last areas of conflict. We hope that the legislation coming out of that Committee will allow for full and expedited development of the NPR's.

V. ELECTRICAL UTILITIES TAX RELIEF PROPOSALS

The President has proposed certain tax relief measures for utilities which were recommended by the Labor-Management Advisory Committee. These measures, known as the Electric Power Facility Construction Incentive Act of 1975, are proposed as a stimulus to the construction of facilities by electric utilities and as a means to insure adequate electric capacity for the future. Mr. William Rosenberg, Assistant Administrator for Energy Resource Development appeared before you on February 24, 1976, and is here today to continue that discussion at your pleasure.

CONCLUSION

As you may know, we are still in the negotiation process with the Office of Management and Budget on the personnel and dollar amounts associated with EPCA. The final determination on these numbers will be forthcoming and will be furnished to the Committee when available.

Mr. Chairman, this concludes my prepared remarks and I shall be happy to respond to any questions you or the Committee Members may have.

Senator Moss. Dr. Seamans.

STATEMENT OF DR. ROBERT C. SEAMANS, JR., ADMINISTRATOR, U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION (ERDA), ACCOMPANIED BY MERWYN C. GREER, CONTROLLER; DR. RICHARD W. ROBERTS, ASSISTANT ADMINISTRATOR FOR NUCLEAR ENERGY; AND DR. WILLIAM Mc CORMICK, DIRECTOR FOR COMMERCIALIZATION, ERDA, AND WILLIAM R. VOIGHT

Dr. SEAMANS. Mr. Chairman, I have a formal statement I would like to submit for the record.¹

¹ See Dr. Seamans' prepared statement, p. 135.

FALLING ENERGY SUPPLY

Mr. CHAIRMAN. I noted in your opening statement that you clearly indicated the direct relationship between our economy and the availability of energy. This is something that ERDA keenly recognizes. In statistical terms, we know that when our supply of energy declines that our gross national product falls off an almost identical amount.

Putting it more bluntly, when such a drop occurs people end up out of work. We observed this in a very specific example last fall when it appeared that we would have a very severe winter; the State of Ohio was concerned that it would not be able to obtain enough natural gas—and many of their industries rely on natural gas. We worked with the Governor, at his request, to see whether they could make use of Devonian shale resource, of which there is a plentiful supply in the State of Ohio.

Unfortunately, there is a great deal of work of a technological nature that remains to be done to learn how to fracture that shale in order to obtain the encapsulated gas.

This is, to me, a very dramatic instance of a potential significant economic disruption caused by an insufficient supply of energy for a particular State, and this could happen any place in the United States.

BUDGET AUTHORITY AND OUTLAYS

You raised a large number of very important issues in your opening remarks, some of which Mr. Zausner has addressed. What I would like to do is spend a few minutes with the aid of five charts that you have in front of you, and just run through our budget pointing out some highlights. The first chart shows our budget authority and budget outlays for 1975 actual, 1976 estimated, and 1977 requested.

CHART 1



ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION FY 1977 BUDGET

(\$ in Millions)

	1977 INCREASE				
	1975	1976	1977	\$	%
	(\$ in Millions)				
BUDGET AUTHORITY	\$3,512	\$4,478	\$6,048	\$1,570	35
BUDGET OUTLAYS	3,165	4,045	5,266	1,221	30

Dr. SEAMANS. We do show a substantial increase in outlays, which go up 28 percent from 1975 to 1976, and 30 percent from 1976 to 1977. Our total budget authority request is \$6.1 billion.

In addition to this sum, we have revenues that are estimated at over \$700 million, so that we anticipate in 1977 that our outlays will be very close to \$6 billion.

This breaks out into approximately 75 percent for operating expenses and 25 percent for capital equipment and plant construction.

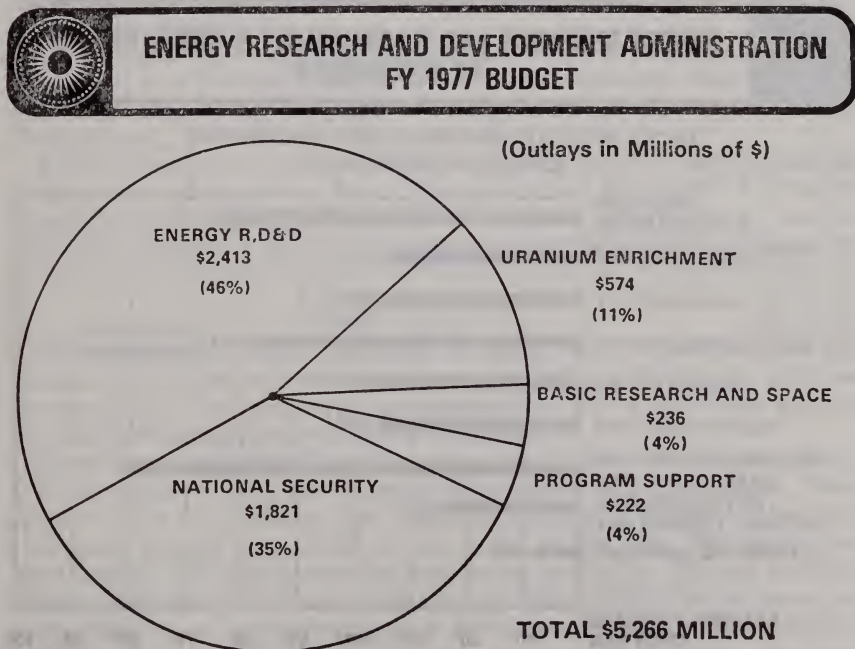
CHART 2

- THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION (ERDA) WAS FORMED IN JANUARY 1975, AS A RESULT OF THE ENERGY REORGANIZATION ACT OF 1974, TO BRING TOGETHER AND DIRECT THE MAJOR FEDERAL ACTIVITIES RELATING TO ENERGY RESEARCH AND DEVELOPMENT.
- THE ENERGY REORGANIZATION ACT ALSO ASSIGNED ERDA THE BASIC RESEARCH AND TECHNOLOGY PROGRAMS, URANIUM ENRICHMENT ACTIVITIES, AND MILITARY PROGRAMS PREVIOUSLY CARRIED OUT BY THE ATOMIC ENERGY COMMISSION.

ERDA'S RESPONSIBILITIES

The next chart is just to make it clear that although ERDA's title is "Energy Research and Development," we actually have other responsibilities, such as basic research including the field of high energy physics, uranium enrichment, and national security.

CHART 3



We breakout these activities in this pie chart arrangement. This shows that 46 percent of our total budget is for energy research, development, and demonstration. Thirty-five percent is national security, and uranium enrichment amounts to 11 percent net of revenues. Finally, basic research and space and program support amounts to 4 percent each.

Senator BELLMON. How much of the uranium enrichment is a net loss?

Dr. SEAMANS. What you see there is the net Federal Government outlays. The total outlays——

Senator BELLMON. How much of that is reimbursed?

Dr. SEAMANS. That amount is after reimbursement.

Mr. GREER. The net figure is the \$574 million that is on the pie chart.

Dr. SEAMANS. We have submitted a legislative proposal for repricing uranium enrichment revenues, and these amounts assume approval of this proposal. If you add the net figure to the revenues, you get the total uranium enrichment effort for which we are responsible. That estimate includes operation of our three plants at Paducah, Ky., Portsmouth, Ohio, and Oak Ridge, Tenn. This does not include the substantial sums that we have for developmental work on uranium enrichment techniques, the centrifuge type, laser enrichment, and so on.

OUTLAY PERCENTAGES FOR VARIOUS PROGRAMS

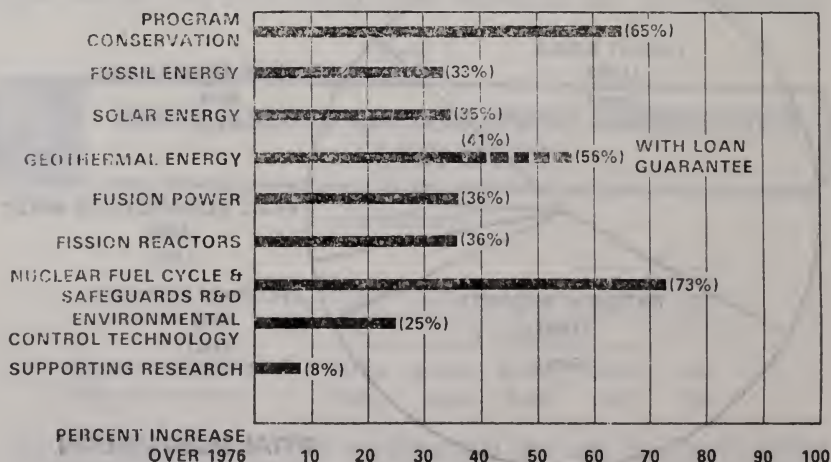
The next chart is a bar graph that shows, at a glance, the percentage increases in outlays for our various programs.

CHART 4



ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION FY 1977 BUDGET

INCREASES FOR ENERGY R,D&D PROGRAMS (Outlays in Millions of \$)



Conservation shows an increase of 65 percent. It must be realized, of course, that it was the one area that we inherited where there was only modest previous activity.

When ERDA was formed, we picked up efforts from the AEC, the Department of Interior, the National Science Foundation and others, all of which had ongoing programs of various dimensions; but in conservation we picked up just a very, very modest amount of

work. So we are still putting together the program. It is expanding rapidly and in fiscal year 1977 it will amount to \$91 million.

The program includes end-use conservation, methods for energy storage, transmission of energy, as well as improved conversion efficiencies.

In fossil energy, there is a 33 percent increase. This includes a modest increase in oil and gas, primarily in tertiary recovery. The primary effort is on coal, and particularly the conversion of coal to other forms—coal gasification and coal liquefaction.

We have a variety of pilot plants. In addition we have one demonstration plant for clean boiler fuel from high sulphur coal going into final design. We are recommending in our 1977 budget that we move out on two coal gasification demonstration plants—one to produce high Btu gas and the other low Btu gas.

SYNTHETIC FUELS PROGRAM

I might just say one word about synthetic fuels. One form of synthetic is from coal. In addition, there is shale. I have already mentioned Devonian shale. The shale in the West is oil shale, and processing the rock to produce oil is extremely important to this country. We believe we should move out vigorously on a synthetic fuels program. We also want to move out on a variety of substitute fuels and biomass conversion.

Our budget shows only \$3 million in outlays for the synfuels program which is for the administration of the synthetic fuel program, but we are requesting \$2 billion in loan guarantee authority to initiate the program.

This is a program that could build up to the order of 350,000 barrels a day or so of synthetic fuel. That would be the start of a major industrial-Government effort that we believe is required if we are going to come even close to having our supplies match our demands.

ENERGY SOURCES

Moving on, the solar industry is very, very important for the future. The 35-percent overall increase includes a 50-percent increase in conversion of solar energy into electricity, and a somewhat smaller increase for heating and cooling of buildings.

Geothermal energy, of course, comes from within the Earth's crust. We can pick it up in the form of live steam in a few places. More often it is in the form of hot water at depths of several miles, and even more energy is available in the form of hot rock. We are learning through our studies what resources are available. We are working closely with the U.S. Geological Survey. We would like to move out more rapidly on our research and development efforts and particularly to start a pilot plant. The loan guarantee provisions are proposed to support future pilot plants using various forms of geothermal energy.

Fusion power takes two forms, magnetic containment and laser induced. This is a very long-term effort. We cannot expect fusion power to be available commercially until well into the next century,

but if we are going to have it available then, we have to be working on it very aggressively today.

The fission reactor effort is primarily on the breeder, particularly the liquid metal fast-breeder reactor. In addition to the effort that we are planning for a demonstration plant at Clinch River in Tennessee, we have the Fast Flux Test Facility in the State of Washington. That test facility will support an important part of that program, namely, work on the fuels themselves.

This is a broad program, and it is essential that we have it underway now if we want to have the option to use the breeder in the future.

BUDGET OUTLAY

The fuel cycle effort is vitally important, and we must go all the way from uranium ore to appropriate waste storage if we are going to make use of our present day light water reactors. That is why we have increased our outlays from \$163 million in fiscal year 1976 to \$282 million in fiscal year 1977. This total includes studies and surveys of uranium reserves, fuel reprocessing and commercial waste management. In the important area of waste management, we have increased our funding fivefold—from \$12 to \$63 million, to close the back end of the fuel cycle. This program also includes work on safeguards.

We have a modest amount for environmental control technology, and in our support research we show a most modest increase.

Senator BELLMON. Before you leave that chart, Dr. Seamans, is it possible to get dollar totals for each of these categories?

Dr. SEAMANS. Of course, I could have given them to you as I went along. They are attached to my statement in a chart¹ that shows the budget authority and budget outlays for both fiscal year 1976 and 1977 for all of these categories.

CHART 5



ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION FY 1977 BUDGET

	FY 1975	FY 1976	FY 1977
	(\$ in Millions)		
OUTLAYS BY FUNCTION:			
ENERGY RD&D	\$1,326	\$1,800	\$2,413
BASIC RESEARCH AND SPACE TECHNOLOGY	213	219	236
URANIUM ENRICHING ACTIVITIES	-34	260	574
NATIONAL SECURITY PROGRAMS	1,506	1,594	1,821
PROGRAM SUPPORT	155	172	222
	<u>\$3,166</u>	<u>\$4,045</u>	<u>\$5,266</u>

¹ See charts 1 and 2, pp. 130 and 131, respectively.

RESEARCH AND SPACE TECHNOLOGY

The last chart summarizes ERDA's total effort. It shows the basic research and space technology programs which include the high energy physics program. The space technology does not show an appreciable increase, because our production of power elements for both the Department of Defense and for NASA are going down at this time. We are, however, putting more research and development in the program so that when NASA initiates future programs, we will be able to give them the appropriate power supplies.

The increase shown in the uranium enrichment category is for two reasons. One is the cost of power is going up, and this calls for an increase in our budget. Also, we are in the process of upgrading and improving our three government enrichment plants, and we are right in the middle of this major investment.

Not shown in our budget is the impact of the Nuclear Fuels Assurance Act. We feel it is very important that this Act be passed so that we can move out on private enrichment of uranium. We will be requesting \$8 billion in contract authority for this purpose.

Our national security program includes the work that we are doing on nuclear weapons, their development, testing, and production, and also the work that is being done on naval reactors.

Finally, program support includes the cost of ERDA's Government employees. It shows an increase from \$172 million to \$222 million although the increase in yearend manpower is budgeted at less than a hundred people. There are many people coming aboard in 1976, and so the full cost of this personnel change shows up in 1977; hence, the marked increase in the budget.

Let me say in closing, Mr. Chairman, that there is a very important policy with which I believe most of us agree; namely, that the delivery system for energy in this country should be and must remain in private hands. Our job in ERDA is to do the long-range research that cannot be justified as a private investment because it is so far downstream. We must work with industry on a variety of joint projects so that we can move ahead more aggressively and more rapidly because of the tremendous importance of energy to our economy.

So we in ERDA think of ourselves as catalytic agents, responsible for working with the private sector in such a way that the private sector picks up the responsibility wherever possible and as quickly as possible to move this country ahead in energy supplies and energy conservation.

Thank you.

[The prepared statement of Dr. Seamans follows:]

PREPARED STATEMENT OF DR. ROBERT C. SEAMANS, JR., ADMINISTRATOR,
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Mr. Chairman and members of the committee: I appreciate the opportunity to appear before you to provide an overview of the Energy Research and Development Administration's budget request for fiscal year 1977.

As you are aware, ERDA has recently completed its first year of operation. Established by the Energy Reorganization Act of 1974, ERDA is to provide unified leadership and direction over Federal activities aimed at developing new and improved energy technologies in order to increase our energy supplies and

achieve greater efficiency in energy consumption. ERDA is also responsible for the basic research and supporting technology programs, uranium enrichment activities, and military programs transferred to ERDA from the Atomic Energy Commission.

ERDA ACCOMPLISHMENTS

Mr. Chairman, I believe we have made significant progress during our initial year of operation. In that relatively short period of time, a substantial concentration of scientific and technical expertise has been mobilized and we have evolved the organizational structure necessary for the pursuit of all promising energy technologies.

Another significant accomplishment was the development and submission to Congress of a National Plan for Energy Research, Development and Demonstration, as required by the Energy Reorganization Act of 1974. This Plan established the relative priorities to be given various energy technologies which could provide a better balance of domestic energy supply and demand over the near, mid, and long terms.

We are currently updating the energy plan. While the priorities have not changed significantly, our updated plan places heavier emphasis on conservation technology as a means of securing more time for bringing new energy technologies into commercial use. It also focuses attention on developing mechanisms to help the private sector commercialize new energy technologies and to ensure their environmental acceptability.

We have made important advances during the past year in all of our energy RD&D programs. In the conservation area, for example, several efforts are underway which have the potential for significant near-term savings in energy consumption.

Ground was broken in Knoxville, Tennessee, for a test residential dwelling using the Annual Cycle Energy System (ACES). This concept has the potential for halving the energy consumed for space conditioning through the utilization of a heat pump and water-ice storage system.

We are seeing promising results from engineering feasibility studies of a grid connected total energy system. This system could provide great flexibility in energy conservation in populated areas. Waste heat from electrical generation is captured and utilized in the heating and cooling of office, commercial, and residential buildings within a concentrated area.

Our fossil and nuclear energy RD&D programs represent two areas that provide the greatest potential for reducing our heavy dependence on oil and gas and for meeting our energy needs between now and the year 2000. In the fossil energy area, sound progress is being made in the development, testing, and demonstration of more efficient methods for the recovery and use of coal, oil, and shale; for example:

A contract has been awarded for the final design of a \$237 million synthetic fuels plant to demonstrate the commercial feasibility of converting high sulfur coal to clean burning liquid and pipeline quality gaseous fuels.

Major demonstrations of fluid injection techniques for increased oil recovery have been undertaken.

An aggressive program in basic coal science and engineering was begun to increase our understanding of coal conversion processes.

A joint program with the British and West Germans has been arranged to construct and operate a fluidized bed research installation to explore more efficient and cleaner coal combustion methods.

A Presidential interagency task force recommended a synthetic fuels commercial demonstration program aimed at producing, in two phases, the equivalent of one million barrels of oil per day by 1985. Legislation authorizing ERDA to initiate the program did not pass the last session of Congress. However, we believe that the need for this program is clear, and the President continues to support its passage in 1976.

We have initiated a program to identify and resolve problems in the nuclear fuel cycle, including the reprocessing of spent reactor fuel, safe disposal of radioactive wastes, and safeguarding of nuclear materials.

Important milestones were also attained in fusion power development. A combination of confinement time and plasma density was produced that was five times better than had been achieved in any previous fusion device. In addition, temperatures needed for a power producing fusion reaction—130 million degrees centigrade—were achieved in another fusion experiment.

The progress made in our solar energy development efforts has been most encouraging. Design work began for the world's largest solar concentrator, which will produce five megawatts of thermal energy and eventually be used to test prototype components for a 10 megawatt electric pilot plant.

In addition: The nation's largest combined solar heating and cooling system began operation at an elementary school in Georgia.

Contracts have been issued for the development of low-cost solar panels to convert sunlight directly into electricity.

We are proceeding with a program recently announced by HUD which will provide 55 grants for the installation of 143 solar units in new and existing dwellings.

Finally, work is nearing completion on plans to define the initial role and mission of a Solar Energy Research Institute which is expected to be established during 1977.

Important steps have been taken in geothermal energy RD&D. We have completed the drilling of two wells into deep hot rock, which have been interconnected by hydraulic fracturing to establish water circulation for heat extraction. This is an important experimental step in recovering useful heat from hot dry rock. An engineering study has been completed and drilling is underway in support of a joint Federal-state project in Idaho for direct heating of buildings using geothermal energy.

Steps were initiated during the past year to develop a more balanced environmental, health and safety research program which would identify and address potentially harmful effects of all energy technologies. The first compilation of the current RD&D efforts of all Federal agencies in these areas was completed.

Finally, we have under review the recommendations of an independent academic, scientific, and industrial study group that could contribute toward more effective utilization of our field and laboratory resources.

While we have made sound progress during the past year, we are all aware that the task remains essentially before us. In order to continue and expand our efforts, we are requesting total 1977 appropriations of \$6.139 billion to carry out our program activities and capital acquisitions. Revenues, primarily from our uranium enrichment activities, are estimated at \$615 million. Thus, total resources of \$6,754 billion would be available to ERDA in 1977. This budget provides an increase of 35 percent in budget authority and 30 percent in budget outlays over 1976 levels for all ERDA activities. Chart I summarizes our total request by five major categories, namely energy RD&D, basic research and space technology, uranium enrichment activities, national security programs and program support.

ENERGY R.D. & D.

Over half of the 1977 increase—\$805 million in budget authority and \$613 million in budget outlays is being requested for our energy RD&D programs to develop alternative energy sources and to help bring supply and demand into better balance. This increase results in total budget authority for energy RD&D of \$2.9 billion in 1977 and reflects the President's strong determination of ERDA's energy RD&D funding is shown in Chart II. Let me expand on these activities for a few moments.

CONSERVATION RESEARCH AND DEVELOPMENT

Because of the key role that conservation technologies will be required to play in the near and mid-term reduction of energy demand, a significant expansion in this program is included in our 1977 request. In the near-term, it is anticipated that conservation research and development efforts will lead to a more productive and efficient use of energy. Mid-term goals included increased energy savings, widespread use of substitute fuels, and the development and commercialization of energy efficient systems for transportation and community development.

Funding for these activities increases in 1977 by 60 percent, from \$75 million in budget authority to a level of \$120 million. The majority of this increase is being requested for "end use" activities, which are concerned with the efficiency of energy usage in the home, industry, and the transportation sector. These programs will emphasize research on conservation technologies which promise to provide energy savings without making a significant impact on our standard

of living, as well as the demonstration of systems and concepts in the real world environment.

More specifically, in the buildings conservation program, efforts will be directed toward the reduction of energy consumption through more efficient space conditioning and utilization of waste heat. Industry-oriented R&D efforts will aim at achieving greater efficiency in processes which are applicable to energy-intensive industries, such as primary metals.

Conservation in the transportation section also receives strong emphasis in our 1977 request. This sector consumes 25 percent of total U.S. energy and over half of the total petroleum used in this country annually. In 1977, additional funding is provided to exploit newly identified areas of savings and to move the alternative automobile engine program into a demonstration stage.

FOSSIL ENERGY DEVELOPMENT

In 1977, our fossil energy development programs will increase from \$398 million to \$477 million in budget authority. This increase is principally related to a greater emphasis on the demonstration of new processes to convert coal to synthetic liquids and gases. Funding is being requested for the design, equipment development, and construction efforts associated with three major demonstration projects which will be cost-shared with industry. Included is continued funding for a clean boiler fuel demonstration plant and initial funding for a high-Btu synthetic pipeline gas plant and a low-Btu fuel gas demonstration plant. Increases are also requested for efforts associated with the expansion of critical elements of our MHD program, which holds the promise of higher conversion efficiency; for engineering and hardware development related to fluidized bed combustors and combined cycle power systems; and for construction and operation of additional test facilities in support of our direct combustion programs.

In 1977, we plan to continue the monitoring and evaluation of experiments to increase the recovery of oil and gas from existing fields.

Finally, we will continue studies on the in-situ production of liquid and gaseous fuels from oil shale and coal deposits. This effort offers the promise of substantial energy resources at a reduced environmental impact when compared to conventional mining and processing techniques.

We strongly support the enactment in 1976 of legislation for a synthetic fuels commercial demonstration program. The 1977 budget provides for fiscal year 1976 supplemental funding of \$503 million in budget authority to cover \$2 billion in loan guarantees for the remainder of 1976. A total of \$6 billion in loan guarantees is expected to be necessary over the 1976 to 1978 time period in order to reach the 1985 objective of 350,000 barrels per day of synthetic fuel production capacity. We intend to work closely with the Congress to obtain authorizing legislation at an early date.

SOLAR ENERGY DEVELOPMENT

The 1977 budget request for solar energy development is \$160 million in budget authority, an increase of \$45 million over the 1976 level. A major portion of that increase is provided for solar electric applications, reflecting a recognition of the need for accelerated development of technology for the conversion of solar energy to electricity. We have concluded that solar electric technology should receive a high priority among our energy RD&D programs, ranking with fusion and the breeder reactor as major long-term energy supply alternatives. The increased funding in 1977 will provide for continued construction of a five megawatt solar test facility which will permit testing and evaluation of the major subsystem concepts under development for the central receiver approach to solar thermal conversion to electricity. We also plan to complete conceptual and begin detailed design of a ten-megawatt solar electric pilot plant in 1977.

We plan to continue efforts begun in 1976 to demonstrate the practicality of solar heating and cooling as a viable option for the near term. Our budget provides for 226 project awards and associated R&D aimed at improving the economics and performance of equipment for later demonstrations. Finally, we will continue broad-based technical and analytical efforts in support of the national solar energy program.

GEOTHERMAL ENERGY DEVELOPMENT

A substantial increase is provided in 1977 for geothermal energy development, reflecting a continued emphasis on activities which have the most potential for

near-term energy production. Funding is requested at a level of \$100 million in budget authority, representing an increase of \$69 million over the 1979 level. Included in this increase is \$19 million for research, development and demonstration and \$50 million for the Geothermal Loan Guarantee Program.

In 1977, support will continue for R&D and assessment activities, with some growth in applications projects and environmental and institutional studies. The most significant increase is in resource exploration and assessment. An increase in advanced technology applications will permit continuation of hot dry rock projects and an acceleration of geopressured resource applications.

The \$50 million in loan guarantee authority being requested will establish a reserve in the Geothermal Resources Development Fund. No appropriation has been provided for this program which was authorized under the Geothermal Energy Research, Development, and Demonstration Act of 1974. Actual outlays from the fund in 1977 are estimated at \$4 million.

FUSION POWER DEVELOPMENT

Increasingly, we find reason to believe that fusion power will be a major contributor to our long-term energy needs, and are requesting \$392 million in budget authority for fusion power development in 1977. This represents an increase of 57 percent over the 1976 level of \$250 million. This substantial increase will allow the exploitation of recent breakthroughs and the continuation of research to determine the scientific feasibility of obtaining virtually unlimited fusion power beyond the year 2000. Construction will continue on the Tokamak Fusion Test Reactor at Princeton, New Jersey. Additionally, the laser fusion program will expand in 1977 and utilize more fully certain unique university and industry capabilities.

FISSION POWER DEVELOPMENT

In 1977, funding for fission power reactor development increases by \$221 million in budget authority to a level of \$823 million. A substantial portion of that increase is being requested for the LMFBR program, along with related safety and environmental research to establish and demonstrate the commercial viability of liquid metal fast breeder reactors. The increase is primarily related to the continued construction of the Clinch River Breeder Reactor demonstration project. Additional cooperative efforts with industry will be pursued in 1977 within the fission reactor development program to increase the operating reliability of existing light water reactor technology.

NUCLEAR FUEL CYCLE R. & D.

We are also requesting a significant funding increase for nuclear fuel cycle R. & D. for the ultimate purpose of improving the use of the Nation's current commercial nuclear reactor technology. The amount requested for this program area in 1977 is \$347 million in budget authority, which represents a virtual doubling of effort over the 1976 level. Included in this area are efforts to:

- Accelerate R.D. & D. to find acceptable technical and environmental approaches for the ultimate storage of radioactive wastes from commercial power reactors through technology demonstrations at various locations;

- Expand efforts directed toward closing the back end of the light water reactor fuel cycle, including R. & D. on the reprocessing and refabrication of spent nuclear fuel discharged from commercial power plants;

- We plan to continue the development and demonstration of centrifuge and laser isotope separation technologies for uranium enrichment. These processes offer the promise of more efficient production resulting in lower electric costs for the consumer; and

Finally, the increase will allow an expansion of the National Uranium Resource Evaluation program to find and assess uranium reserves.

In addition, ERDA is soliciting industry's suggestions regarding the means to overcome specific obstacles to commercial nuclear fuel reprocessing and cycle. ERDA will review the responses from industry to determine what, if any, Federal Government actions and assistance are appropriate for establishing, at an early date, a viable commercial reprocessing and recycle industry, with minimum Government involvement and investment.

Our 1977 request also provides increased funding for efforts to insure that the biomedical and environmental impacts associated with the development and

utilization of both nuclear and nonnuclear energy technologies are fully addressed at each stage of the R.D. & D. program. Efforts will continue in basic materials, molecular, mathematical, and geosciences research directed toward the solution of scientific and engineering problems that constrain the development of energy technologies.

BASIC RESEARCH AND SPACE TECHNOLOGY

In 1977, a moderate increase is provided in support of the high energy physics program through which we seek to understand the fundamental structure of matter and the physical forces of nature. We plan to proceed with construction of the \$78 million Positron-Electron Project (PEP)—a joint effort by the Lawrence Berkeley Laboratory and Stanford Linear Accelerator Center in California. This project will provide a capability to explore new physical domains of matter and energy.

URANIUM ENRICHMENT ACTIVITIES

The budget includes \$1.3 billion in budget authority to support our uranium enrichment activities. The requested level of funding reflects higher operating costs and increased production of separative work in order to provide an inventory sufficient to meet increasing demand and support the transition to private enrichment for future additional capacity. Funding is also provided to continue the Cascade Upgrading and Cascade Improvement Programs to modernize and upgrade our existing uranium enrichment facilities to increase their production capacity.

These costs are partially offset by the receipt of revenues from our toll enriching activities, estimated to be \$539 million in 1977. Our budget also contemplates early favorable action on our legislative proposal for a revised basis of pricing uranium enriching services. Submitted in May 1975, this legislation would establish a fair price for enriching services to recover the Government's cost on an unsubsidized basis.

The Nuclear Fuel Assurance Act was submitted to Congress last summer. This legislation is designed to encourage private industry to undertake construction of the next increments of plant capacity to support the growing domestic and foreign nuclear power industry. Enactment of this legislation on a timely basis would relieve the taxpayer of a substantial burden in 1977 and subsequent budgets.

While we continue to expect private industry to provide the next increments of uranium enrichment capacity, we have a backup plan to insure uninterrupted supplies of nuclear fuel in the event that private efforts are not successful. We anticipate that the President will send to the Congress early in this session a supplemental appropriation request for this purpose. If later required, the Administration will also consider submission of a 1977 budget amendment as part of the backup plan.

NATIONAL SECURITY PROGRAMS

The budget we are discussing today includes \$1.9 billion in budget authority for our National Security programs, an increase of \$316 million over the 1976 level. Over the past six years, there has been a serious decrease in the level of research and development effort in the weapons laboratories. The 1977 weapons budget request will help to arrest this trend.

Our 1977 National Security budget request reflects higher operating costs in our special nuclear materials and weapons production facilities. A significant portion of the increase is needed for continuation of the upgrading of safeguards and security at ERDA facilities holding nuclear weapons, components or significant quantities of special nuclear materials, and the improvement of waste storage facilities for ERDA's radioactive wastes associated with the weapons program.

In summary, Mr. Chairman, I believe we have made sound progress during ERDA's first year of operation. The 1977 request reflects the President's strong determination to pursue a vigorous program in energy research, development, and demonstration—an urgent national need to achieve our goal of energy independence.

At this time, I would be pleased to respond to any questions you may have.

CHART I.—ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION FISCAL YEAR 1977 BUDGET REQUEST

[Dollars in millions]

	1976		1977	
	Budget authority	Budget outlays	Budget authority	Budget outlays
I. Energy research, development and demonstration:				
Direct energy programs.....	1,657	1,427	2,435	2,009
Supporting research.....	403	373	430	404
Subtotal.....	2,060	1,800	2,865	2,413
II. Basic research and space technology:				
High energy physics.....	180	178	220	197
Space technology and other.....	42	41	43	39
Subtotal.....	222	219	263	236
III. Uranium enrichment activities:				
Uranium enrichment activities.....	955	873	1,316	1,204
Revenues.....	—613	—613	—630	—630
Subtotal.....	342	260	686	574
IV. National security:				
Weapons activities.....	1,010	1,009	1,203	1,154
Weapons materials production.....	381	346	540	446
Naval reactor development.....	236	239	200	221
Subtotal.....	1,627	1,594	1,943	1,821
V. Program support	227	172	291	222
Grand total	4,478	4,045	6,048	5,266

CHART II.—ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION FISCAL YEAR 1977 BUDGET REQUEST—
ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAMS

[Dollars in millions]

	1976		1977	
	Budget authority	Budget outlays	Budget authority	Budget outlays
Direct energy programs:				
Conservation.....	75	55	120	91
Fossil energy.....	398	333	477	442
Solar energy.....	115	86	160	116
Geothermal energy.....	31	32	100	50
Fusion power development.....	250	224	392	304
Fission reactor development.....	602	522	823	709
Nuclear fuel cycle and safeguards R. & D.....	173	163	347	282
Environmental control technology.....	13	12	16	15
Subtotal.....	1,657	1,427	2,435	2,009
Supporting research:				
Environmental research.....	193	185	203	199
Basic energy sciences.....	210	188	227	205
Subtotal.....	403	373	430	405
Total energy research, development and demonstration program	2,060	1,800	2,865	2,413

¹ Includes \$50,000,000 in budget authority and \$4,400,000 in budget outlays for the geothermal loan guarantee program.

Senator Moss. Thank you, Dr. Seamans.

NUCLEAR R. & D.

Regarding the nuclear R. & D. effort, it is not clear to me just where the dividing point is, or the interface between the national security

programs with ERDA and DOD. And I see that the cost continues to rise.

Is that simply R. & D. on nuclear weapons, or does it go beyond that?

Dr. SEAMANS. It does go beyond that, and let me explain it in a little more detail.

When ERDA was formed, it incorporated all of the Atomic Energy Commission except the regulatory function. All of that went into the Nuclear Regulatory Commission now chaired by Mr. Anders.

NUCLEAR WEAPONS

In the enabling legislation, it clearly stated that ERDA was to continue to perform the nuclear weapons effort that the AEC had been carrying out for at least 1 year.

At the end of that year, ERDA and the Department of Defense were to make a recommendation to the President for submittal to the Congress as to the ultimate disposition of that activity. This we have done. We have submitted our recommendations to the President and as yet they have not been passed on to the Congress.

The weapons effort includes research and development, and \$362 million, is in this request. Testing would be \$245 million, and is primarily the underground test program at Nevada. Production accounts for \$545 million. Production, of course, has to be intimately geared to the Department of Defense's needs, as we are tasked by DOD to produce the nuclear weapons that go with their various weapons systems.

In addition, we are responsible for weapons materials production. Finally, and really quite separate from the weapons part, is the work that is going on in ERDA in the development of naval nuclear propulsion plants that go into submarines such as the *Trident*, as well as new frigates and aircraft carriers. That is the work that is headed by Admiral Rickover.

Senator Moss. That does reflect in your budget and not in the DOD budget?

SEGREGATE WEAPONS BUDGET

Dr. SEAMANS. That is correct. However we have recommended that our weapons budget be segregated from the rest of the ERDA budget in such a way that it could be reviewed alongside the DOD budget by the administration as well as the Congress.

The Armed Services Committees have our weapons budget available when they review the armed services programs.

Senator Moss. Is any of this funding that you utilize in the 050 budget function?

Dr. SEAMANS. I guess I do not know what 050 is.

Mr. GREER. The National Security Function?

Senator Moss. Yes.

Mr. GREER. Yes; this does get reported in function 050, and it is reviewed by the Joint Committee on Atomic Energy and the Armed Services Committee in that category. The Joint Committee will provide an estimate for this category, and the Armed Services will review that.

Senator Moss. I understand that 47 percent of ERDA's 1977 proposed budget for energy research and development is devoted to nuclear power. Given the past Federal investments in nuclear technology, and given the fact that nuclear industry infrastructure already exists in our society, will we not become extremely dependent upon nuclear power despite interest in and publicity about exotic technologies like solar and geothermal research?

Dr. SEAMANS. It is our view, Mr. Chairman, that we should be moving into other areas of energy, such as the solar and the geothermal. That is the reason we have substantial increases in those areas.

However, we also have to make maximum use of our coal, which is now readily available. We have a third of the world's supply. We have to make use of our uranium resources. We do have 57 nuclear plants online and another 65 or so that are coming online. We feel it is imperative that we do use this capability.

The energy research development and demonstration portion of our budget, is 46 percent of the total, and that is certainly a large percentage. Actually, a very small part of that, namely, \$10 million, is work on the light water reactor itself. This is the type reactor currently being used by the utilities.

This \$10 million is for a program to study the type of failures that are now occurring, that are leading not to problems of safety, but to downtime of these reactors. We want to see whether our research labs can do fundamental work that could lead to more efficient use of these reactors.

The remainder energy funds related to the fission effort is for longer term programs, either for more advanced nonbreeder type reactors like the high temperature gas reactor, or the breeder itself. The largest percentage of the nuclear fusion effort is on the breeder development.

Senator Moss. What effects will it have if one or more of our States pass a nuclear moratorium such as the one they are talking about in California, notably?

Dr. SEAMANS. Mr. Zausner will take that.

Senator Moss. All right.

Mr. ZAUSNER. Mr. Chairman, I would add one thing to Dr. Seamans' comment on nuclear power and then talk about the moratorium.

When we look at the next 10 years and we look at how fast energy is going to grow, it is clear that it is going to grow slower in the future than it did in the past.

Instead of growing at 4 percent, like it did in the past 15 years, it may grow 2 percent.

DECLINING SOURCES OF ENERGY

Even with that much slower growth rate, oil and gas supplies, as you know, are dropping very rapidly, and we would be lucky to hold them constant or increase them slightly. That means that all of the increase of energy demand that we are going to experience in the next 10 years, and I might add even at the 2.5-percent growth rate, you need 50 percent or 40 percent more energy in 1985 than you do today.

That has to come from only one of three sources: coal, nuclear power, or imported oil. Those are the only three options we have. As Dr. Seamans has pointed out, the new technologies, no matter how fast we work on them, will make a minor contribution in the next 10 years.

COAL PRODUCTION AND NUCLEAR ENERGY

If we want to keep imports under control, we need something like a doubling of coal production, as well as something like a fivefold or sixfold increase in nuclear power, and only if both of those occur can you roughly keep imports at today's level.

So when we look at our energy goals, coal and nuclear are keystones, if you will, to achieve them. It is the way we look at the tradeoff there, and because of that, the synthetic fuels program and the nuclear program and the other things we are doing in those two areas are the major things to get to where we have to go. We cannot avoid or ignore oil and gas, or conservation, but those two supply actions are key.

NUCLEAR MORATORIUM

In the terms of the nuclear moratorium specifically, I will make a couple of comments. In the national sense, if California, and just California, decided that it did not want any new nuclear powerplants, I do not think the effect would be staggering. In other words, if only one State such as California decided to put a moratorium on nuclear plants, its national impact would not be great.

Its regional impact, however, might be quite significant, and we have a major study underway to look at the regional impacts if California were to put a moratorium on nuclear power.

It looked like electric power costs would be higher, there might be significant environmental problems in Arizona, if they built coal-fired plants and shipped the electricity in.

More importantly is what might happen if other States followed the lead and we had a nationwide moratorium.

If that occurred, electricity costs would be higher, and something on the order of 250 to 400 million tons of additional coal production would be needed to offset the loss of power from nuclear plants.

If you keep in perspective that we are going from 600 million tons to something like 1 billion or 1.2 billion in 1985, that to contemplate on top of that another 200 or 400 million tons by 1985, frankly, I do not think it is possible.

So our largest concern is if there were something like a nationwide nuclear moratorium, the practical result, I believe, would be several million barrels a day of increased oil imports and electricity costs substantially higher than if we build the coal and nuclear plants. That is our major concern.

Senator Moss. Senator Beall?

CONSERVATION EFFORTS

Senator BEALL. You mentioned that demand was dependent on our conservation efforts. How would you characterize our conservation efforts at the present time?

Mr. ZAUSNER. Mixed. Senator, in the following sense. Today, we see demand of petroleum about 3 million barrels a day below the peak. Of that, 2 million barrels a day appears to be due to the economic slowdown and about a million barrels a day of demand reduction, as best as we can tell, is due to energy conservation, and we think largely due to price.

In the next 10 years, it is essentially under our control. By that, I mean. I think if we do not implement any energy conservation measures, the growth will be 3 percent.

Today, we do not have enough legislative authority to have an aggressive program, but if we did, I think the growth rate could be near 2 percent. I think the important actions taken so far are in the EPCA, appliance labeling and these mandatory standards for new autos.

What is still missing, however, is the number of actions to cut down energy use in the home, national building standards, which still have not been passed for new homes, insulation tax credits to help people install insulation in existing homes, and some kind of a grant program to help the low income and elderly to make these changes.

If we do these things and a few more, I think we can keep the growth rate to around 2 or 2.5 percent.

Senator BELLMON. Even if the economy picks up?

Mr. ZAUSNER. Yes; that assumes the economy will grow between 3.5 and 4 percent over the next 10 years.

ECONOMIC AND ENERGY GROWTH

Senator BELLMON. How can you have a 4-percent per year growth in the economy on a 2-percent growth in energy?

Mr. ZAUSNER. Up to now, economic growth and energy growth have grown roughly at the same rate. But that is because energy was cheap and we did not, in fact, try very hard to cut off the waste. I think there is substantial waste in the system, and I think we can have a growth rate for energy slower than the economic growth rate without hurting the economy.

In other words, we can continue to build 10 million cars per year, but if we improve them to get 20 miles a gallon in 1980, then by 1985, petroleum demand is a million barrels a day less than it otherwise would have been. There are a lot of examples where we can have economic growth, build new houses and cars and factories, but where that construction embodies energy conservation. I think it is consistent.

Dr. SEAMANS. Senator Bellmon, that is very central to the conservation program we have in ERDA. It is not a question of giving up transportation or giving up a certain amount of floor space, or giving up certain industrial capabilities. It is learning how to use the energy more efficiently to get the same job done.

Energy supplies have been plentiful and inexpensive in the past and we are inefficient users of energy. We want to improve the process, and as time goes on we will have the opportunity for some of the new developments now underway in ERDA to make striking improvements.

INSULATION TAX CREDIT

Senator Moss. Mr. Zausner, the administration apparently still supports the 1977 insulation tax credit, but it does not appear to be in the 1977 budget.

Mr. ZAUSNER. I am pretty sure it is in the budget, Senator. I will check and see if it is in the budget.

[The following was subsequently supplied for the record:]

The 15 percent Insulation Tax Credit was not included in the President's 1977 Budget, but it is included in the Administration's Tax Reform Package and the tax expenditures resulting from this credit would be offset by savings from other tax reform measures.

ENERGY SOURCES

Senator BEALL. How about ocean thermal?

Dr. SEAMANS. I did not go into all aspects of our solar energy program which includes ocean currents and ocean thermal gradients, such as the gradient that you have in the Gulf Stream.

We do have studies of thermal gradients in progress. At the moment we want to keep those conceptual studies. We do not think we are ready to proceed with a major development effort.

OFF-BUDGET EXPENDITURES—URANIUM ENRICHMENT

Senator Moss. I asked a question earlier about the off-budget expenditures for energy; for example, uranium enrichment.

Does the administration proposal run counter to the new Budget Act, whose purpose was to tie together all Federal expenditures and provide a mechanism to control them?

What about the \$25 billion in capital stock. Don't all these funds represent Government obligations? Why shouldn't they be under the realm of the budget resolution?

Dr. SEAMANS. I think here you are referring to two different things. One is the EIA, and the other is the Nuclear Fuels Assurance Act.

CONTRACT AND BUDGET AUTHORITY

Mr. GREER. In the Nuclear Fuels Assurance Act the issue is contract authority to go ahead and work with industry to guarantee some contracts and to assist them in the technical arrangements so as to obtain private entry into the uranium enrichment field.

The question is whether you need budget authority in addition to contract authority. We have examined this question within the administration and believe that the intent of the Budget and the Impoundment Control Act is to require budget authority when an action will result in a future outlay for the Government.

Since this effort is one of assistance in which our costs would be recovered, we do not see outlays arising from the Nuclear Fuel Assurance Act, and we feel it should not require budget authority commensurate with the contract authority.

That point is discussed in a letter that Jim Lynn, the Director of the Office of Management and Budget addressed to the committee earlier this month. We and the OMB would be glad to discuss it further with the committee if you like.

Senator Moss. I have that letter, which is dated March 5, 1976, from Mr. James T. Lynn, Director, OMB, to Senator Muskie. Without objection, the letter will be included in the record. The purpose of the letter is to inform the chairman of the administration's plans regarding implementation of the pending Nuclear Fuel Assurance Act—the NFAA, H.R. 8401 and S. 2035. The administration proposes to have ERDA enter into a cooperative arrangement with private industry, pursuant to the NFAA to finance, build, and operate additional uranium enrichment plants. The thrust of the letter is that the administration does not “consider the \$8 billion contingent liability”—for financing this effort—“to be budget authority under provisions of the Congressional Budget Act of 1974.” Rather, the administration contends that the \$8 billion “should be treated as financial assurances” and not considered as new budget authority, because they consider it “unlikely that future outlays will be incurred.”

Senator Muskie has requested an opinion on this matter from the Comptroller General. That opinion is expected in the next day or two and will also be made a part of the record. Accordingly, the record will be left open.

[The letters referred to above follow:]

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF MANAGEMENT AND BUDGET,
Washington, D.C., March 5, 1976

HON. EDMUND S. MUSKIE,
Chairman, Committee on the Budget,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: The Administration intends shortly to propose to the Congress additional FY 1976 appropriation language for the Energy Research and Development Administration to implement the pending Nuclear Fuel Assurance Act (the NFAA, H.R. 8401 and S. 2035). Action on this appropriation language is the second vital step in a three-step congressional review and approval process to make it possible for private industrial firms to finance, build, own and operate additional uranium enrichment plants needed by the Nation.

The first step is enactment of the NFAA which provides ERDA a basis for proceeding with the negotiation of cooperative agreements with private firms that wish to build uranium enrichment plants. (Under the proposed NFAA, cooperative agreements could not be signed until steps 2 and 3 below are completed.)

The second step is the passage of appropriation language which sets an upper limit on the U.S. Government's liabilities in the unlikely event that it were necessary for the Government to assume the domestic assets and liabilities of firms covered by cooperative agreements. The practical effect of this step is to provide a basis for private firms to obtain necessary debt financing in the commercial capital market. It would permit completion of negotiations between ERDA and private firms.

The third step is the submission of unsigned cooperative agreements to the Congress for final review and approval.

When this three-step process is completed and cooperative agreements are signed a contingent liability would be assumed by the U.S. Government. This contingent liability could amount to \$8 billion. Such an amount would cover the domestic portion (40%) of a large gaseous diffusion plant (\$1.5 billion) and three smaller centrifuge plants (\$3 billion) as well as provide for contingencies (\$3.6 billion) including escalation.

I must emphasize that it is the Administration's firm expectation that none of this contingent liability would result in Federal expenditures for the assumption of private ventures because of the high degree of assurance discussed below, that commercial firms will be successful.

The purpose of this letter is to inform you of our plans and to explain why we do not consider the \$8 billion contingent liability to be budget authority under provisions of the Congressional Budget Act of 1974. We want to be sure

that your Budget Committee accepts this conclusion so that disagreements do not arise at a later date when they might slow up the Congressional approval of the appropriation language mandated by the NFAA.

URANIUM ENRICHMENT

By way of additional background, uranium enriching—a service essential to the production of nuclear fuel—is now a fully developed production activity carried out in the U.S. solely by ERDA. This large ERDA production activity could be capable of supplying enrichment services to as much as 329,000 MWe of nuclear generating capacity by the early 80's. This capacity, however, is now fully contracted to domestic and foreign utilities. The pending Nuclear Fuel Assurance Act and the proposed appropriation language are intended to assure that: (1) the next increments of uranium enrichment capacity will be built and operating when needed to supply the growing demand for fuel for nuclear power electricity generating plants; (2) all future capacity increments will be built, financed and operated by private industry, thus ending the current Government monopoly and drain on the Federal Budget; (3) the Government will receive appropriate compensation for the use of its inventions and discoveries; and (4) all necessary domestic and international controls on nuclear materials and classified technologies will be maintained as they would be if the Government itself were to own the new plants.

The construction of new U.S. uranium enrichment plants required by the year 2000 is estimated to cost \$30-50 billion (in 1976 dollars). If the Government had to build these plants, the capital costs of the new plants would by 1985 exceed revenues for these plants by about \$9 billion (in 1976 dollars, i.e., escalation is not taken into consideration). Even the construction by the Government of only the next increment of new enrichment capacity would have a major budgetary impact for the next ten years.

In contrast, this financial burden would, under the President's proposal outlined above, be borne by the private sector which is ready and willing to do so. Ideally, industry would assume the entire responsibility for building succeeding increments of capacity. Without even the limited assurances provided for in the President's Plan. However, it has not been possible for private firms to obtain the necessary debt financing for such ventures because of the special circumstances involving uranium enrichment which are not commonly faced in the business environments.

Specifically: (1) the very large size of an enrichment project; (2) the use of technologies that are classified; (3) regulatory uncertainties associated with a first of a kind venture; and (4) the current financial difficulties of some of the utilities that would be the customers for uranium enrichment services.

The limited cooperation and temporary assurances contemplated in the NFAA are designed specifically to overcome these obstacles and make the risk that is involved for potential lenders of debt money more nearly comparable with the risk associated with other investment opportunities available to them.

Under the President's proposal outlined above, the Federal Government would incur a contingent liability when a cooperative arrangement is entered into by ERDA pursuant to the Nuclear Fuel Assurance Act. The major Government contingent liability is based on the possible need to acquire the domestic assets and assume liabilities (including debt) of a private enrichment project in the unlikely event that the venture were unable to proceed (Section 2 of the proposed Nuclear Fuel Assurance Act). Again, it must be stressed that we do not expect any expenditure of funds for the assumption of assets and liabilities of a private uranium enrichment venture. We are confident in this view because the technology has been thoroughly demonstrated over the past 30 years and because of the oversight role ERDA will play with respect to these private enrichment firms.

Since it is unlikely that future outlays will be incurred, we believe that the \$8 billion to be included in appropriation language should be treated as financial assurances and that the limitation on cooperative arrangements (\$8 billion) made by ERDA pursuant to the Nuclear Fuel Assurance Act, should not be considered as new budget authority. We base this interpretation on Section 3(a) (2) and 401(c) (2) of the Congressional Budget Act of 1974 (P.L. 93-344).

Section 3(a) (2) of P.L. 93-344 states: "The term 'budget authority' means authority provided by law to enter into obligations which will result in immediate or future outlays involving Government funds * * *" (emphasis added).

Since the \$8 billion to be included in appropriation language pursuant to the NFAA in all likelihood will not result in immediate or future outlays, we believe it does not conform to this definition of budget authority.

In the unlikely event that conditions were to arise in the future where it appeared that contingent liabilities would require liquidation, an appropriate amount of budget authority and outlays would be estimated in the President's budget for that year. Specifically, the estimate of budget authority would be in the amount of the borrowing from the Treasury needed to cover the necessary liquidation. This is similar to other Federal Programs containing contingent liabilities assumed by the Federal Government (e.g., government insurance programs).

I suggest that it might be desirable for my staff to meet with yours to discuss further the Nuclear Fuel Assurance Act and the appropriations language mandated by the Act. This can be arranged through my office.

I would personally appreciate any comments you may have on this matter.

With best personal regards.

Sincerely yours,

JAMES T. LYNN, *Director.*

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, D.C., March 16, 1976.

Hon. EDMUND S. MUSKIE,
Chairman, Committee on the Budget,
U.S. Senate.

DEAR MR. CHAIRMAN: This refers to your letter of February 16, 1976, in which you asked our opinion on whether the contract authority authorized by S. 2035, the "Nuclear Fuel Assurance Act of 1975," is "budget authority" within the definition of the Congressional Budget Act of 1974, titles I-IX of Pub. L. No. 93-344, July 12, 1974. In this regard, you note that the Office of Management and Budget (OMB) apparently takes the position that the authority authorized by S. 2035 does not constitute budget authority within the meaning of the 1974 statute because it is representative only of a contingent liability of the United States. Thus, OMB does not believe it is required to include initially the authority in the Budget.

THE RELEVANT PROVISIONS OF S. 2035

General

As I noted in my testimony of December 10, 1975, before the Joint Committee on Atomic Energy, copy attached, S. 2035, if enacted, would:

1. Authorize the Energy Research and Development Administration (ERDA) to enter into cooperative arrangements with as many private firms that wish to build, own, and operate enrichment plants as the ERDA Administrator believes necessary to develop a competitive industry;
2. Authorize ERDA to provide various forms of assistance and assurances under such arrangements;
3. Limit the Government's total potential liability to \$8 billion in the event that the private ventures fail and the Government has to take them over;
4. Authorize ERDA to start construction planning and design activities for expanding one of the Government's existing enrichment plants as a contingency measure; and
5. Provide for congressional review of the basis for the cooperative arrangements by the Joint Committee.

In addition to my testimony, on October 31, 1975, we submitted a comprehensive report to the Joint Committee on Atomic Energy which, among other things, evaluated the subject legislation. A copy of this report is also enclosed.

The authority granted

As noted, S. 2035 proposes that authority be given to ERDA to enter into cooperative agreements with private industry for the expansion of the nation's uranium enrichment capacity. As regards the potential outlay of Government funds, it is clear that such authority would take the form of contract authority. Section 3 of the bill, in part, sets forth the mechanism by which the contract authority is granted:

"SEC. 3. The Administrator of the Energy Research and Development Administration is hereby authorized to enter into contracts for cooperative arrangements, without fiscal year limitation, pursuant to section 45 of the Atomic Energy

Act of 1954, as amended, in an amount not to exceed in the aggregate \$8,000,000,-000 as may be approved in an appropriation Act." (Emphasis added.)

Thus, passage of S. 2035 would not, *per se*, be sufficient to create budget authority—its provisions cannot be implemented until such action is specifically approved in an appropriation act. That this procedure is intended is shown by both the language of the bill and the Joint Committee hearings thereon. The procedure is required by title IV of the Budget Act.

Should it be necessary to liquidate any contract authority granted in an appropriation act, section 3 of S. 2035 states—

"* * * In the event that liquidation of part or all of any financial obligations incurred under such cooperative arrangements should become necessary, the Administrator of the Energy Research and Development Administration is authorized to issue to the Secretary of the Treasury notes or other obligations up to the levels of contract authority approved in an appropriation Act pursuant to the first sentence of this section [The previously quoted excerpt] * * *." (Emphasis added.)

And, during testimony before the Joint Committee on S. 2035, Mr. R. Tenney Johnson, General Counsel, ERDA, stated—

"There is no commitment to be entered into by the ERDA negotiating team until there has been action by the Appropriations Committee and action by this committee that would permit the making of the commitment." *Hearings on S. 2035 before the Joint Committee on Atomic Energy, 94th Cong., 1st Sess., at 9 (1975).*¹ (Emphasis added.)

Thus, we think it is clear that S. 2035 is authorizing legislation that, if passed, would require subsequent approval in an appropriation act before contract authority is created. The question is whether that contract authority is "budget authority" within the meaning of the Budget Act. If it is, it must be listed in the Budget. Budget Act, title III.

The nature of the Federal Commitments

As indicated, S. 2035 sets forth the various types of cooperative arrangements with private industry into which ERDA may enter. The bill would authorize ERDA to

"* * * enter into cooperative arrangements with any person or persons for such periods of time as the Administrator of the Energy Research and Development Administration may deem necessary or desirable for the purpose of providing such Government cooperation and assurances as the Administrator may deem appropriate and necessary to encourage the development of a competitive private uranium enrichment industry * * *." (Emphasis added.)

The hearings on S. 2035 make clear that the quoted language is intended to allow ERDA (and, therefore, the United States) to assume, insofar as approved in an appropriations act, the capacity of a financial guarantor of the debts incurred by a private enterprise incident to its development of expanded uranium enrichment facilities. See, e.g., *Hearings at 8, 14, 43, 51, 53, 75, 78, 135, 151, 162, 171, and 182.* Our comments that follow on S. 2035, however, are made with only the most tentative and preliminary knowledge of the details of whatever cooperative agreement ERDA may enter into in its capacity of what the hearings repeatedly refer to as "guarantor." It should be further noted that the amount of the guarantees ERDA can offer may be limited by the necessary approval it must obtain in the appropriations act. Nevertheless, in general outline, it appears that the Federal government would, if a cooperative agreement so provided within the limits established by the appropriations act, be obligated to honor the debts incurred by the private enterprise that was party to that agreement and that experienced financial difficulty.

Procedures in the event of default

Should it become necessary to honor a financial guarantee, S. 2035 sets forth the procedure by which ERDA obtains funds to liquidate its contract authority obligations:

"* * * In the event that liquidation of part or all of any financial obligations incurred under such cooperative arrangements should become necessary, the Administrator of the Energy Research and Development Administration is authorized to issue to the Secretary of the Treasury notes or other obligations up to the levels of contract authority approved in an appropriation Act * * *"

¹ Hereinafter referred to as "Hearings."

The bill further specifies that the notes and obligations issued to the Secretary of the Treasury by ERDA shall contain terms satisfactory to the former and that the Secretary is authorized to use funds derived from the proceeds of securities issued pursuant to the Second Liberty Bond Act to purchase ERDA's notes. Finally, the Secretary of the Treasury is to treat his purchase of ERDA notes as public debt transactions of the United States.

THE BUDGET ACT OF 1974

The Budget Act of 1974 is a comprehensive statute that sets forth many of the procedures by which the Federal budgetary process is to operate.

The statute also defines some of the budget terms under its purview. Among the concepts defined is the term "budget authority":

"The term 'budget authority' means authority provided by law to *enter into obligations which will result in immediate or future outlays* involving Government funds, *except that such term does not include authority to insure or guarantee the repayment of indebtedness incurred by another person or government.*" Act, section 3(a) (2), 31 U.S.C. 1302(a) (2) (emphasis added).

This provision sets forth two relevant criteria that must be satisfied before the authority to enter into obligations to expend money is to be considered "budget authority." First, there must be a certainty that the obligations entered into with the authority granted *will* cause either present or future Federal expenditures. And, second, the authority may not be a guarantee.

The legislative history of the Budget Act provides the rationale for the Act's treatment of guarantees:

"The Committee substitute clarifies the status of insured and guaranteed loans. Such loans are not direct obligations of the United States, and a liability is incurred only in the case of default. *Thus, it would not be appropriate to regard such contingent liabilities as budget authority for purposes of determining the appropriate levels in the budget resolution.* Nor should loan guarantees be subjected to the new procedures for handling backdoor spending authority. Of course if the United States is required to make any outlays pursuant to its guarantee of loans, such outlays are included in the budget." S. Rept. No. 93-688, 93d Cong., 2d Sess. 13 (1974) (emphasis added).

See also page 99 of the Special Analyses, *Budget of the United States Government, Fiscal year 1977* which states the existing practice regarding the budgetary handling of guarantees:

"Guaranteed loans, like off-budget direct loans, are not reflected in the budget at the time credit is extended. Budget impacts from loan guarantee programs, excepting additional subsidies and administrative costs, occur only when defaults require the Federal Government to pay lenders' claims."

We have not, in addressing the question whether the contract authority contemplated by S. 2035 would become "budget authority" as that term is defined in the Budget Act, confined our considerations to the fact that authority to guarantee indebtedness is excluded from the definition. We have also taken into account that the fundamental objective of the Congressional Budget Act of 1974 was to establish a process through which the Congress could systematically consider the total Federal budget and determine priorities for the allocation of budget resources. We believe this process achieves its maximum effectiveness when the Budget represents as complete as possible a picture of the financial activities of Federal agencies. We further believe it is vital to maximizing the effectiveness of the process that Federal financial resources be measured as accurately as possible because priorities are actually established through decisions on the conferring of this authority. From this standpoint, therefore, the concept of "budget authority" should (a) encompass all actions which confer authority to spend money, (b) reflect as accurately as possible the amount of such authority which is conferred and (c) be recognized at the point at which control over the spending of the money passes from the Congress to the administering agency.

While the concept of "budget authority" is relatively simple, it is difficult to apply because of the wide diversity of Federal activities and the variety of forms in which the authority to spend money is conferred. The application of the concept to loan guarantee programs is particularly difficult because the amount of money which eventually may be spent is usually uncertain. Because of this uncertainty, the traditional budget treatment of loan guarantee programs prior to passage of the Budget Act has been to disregard the face amount of the contingent liability in measuring budget authority and look, instead, to some other

indicator of probable cost as a more reliable indicator of the actual budget resource impact of the authority which has been conferred.

In many cases, a useful alternative indicator has been the financing which was provided to liquidate the contingent liability. If, for example, an agency has been authorized to guarantee \$100 million in loans and has been authorized to borrow \$20 million from the Treasury, if necessary, to liquidate the guarantee, traditional budgetary treatment prior to passage of the Budget Act would have counted the \$20 million as budget authority, not the \$100 million. The logic behind this approach was that the financing provided to liquidate the guarantees presumably represented the probable upper end of the range of potential cost of the program. Under these circumstances, the financing that was provided was a better indicator of the resource commitment than the face value of the guarantee.

The alternatives to this approach are:

1. Consider the entire amount of the guarantee as the resource commitment; or
2. Construct some other estimate of the probable cost; or
3. Consider no part of the amount of the guarantee as a resource commitment.

The first is a distortion in that a loan guarantee approach only makes sense where some of the loans will not be subject to default. The second alternative is attractive in theory, but in most cases will produce a result similar to the traditional one. That is, the financing provided in a program can be presumed to bear some relationship to anticipated costs. In addition, where the Congress has voted a specific limitation, there attaches a significance which could not be attached to a separately determined estimate. The third alternative discounts the fact there is some risk, and thus some implicit commitment of resources, or the loan guarantee would be unnecessary.

For the reasons more fully set forth below, the third alternative—consider no part of the amount of the guarantee as a resource commitment—nevertheless is the one permitted by the Budget Act's definition of "budget authority." The definition clearly excludes guarantees. The consequence, we believe, is to thwart Congress' achieving the maximum effectiveness of the process it established to review the Federal budget and determine priorities. For this reason, it is appealing to entertain the possibility that when Congress defined "budget authority" as it did, it merely intended by such language to continue the pre-Budget Act practice of avoiding the listing in the Budget of the unfunded portions of the Federal guarantees. Thus, because S. 2035 provides that all of the guarantee authority would be financed (the entire obligation is funded via Treasury loans to ERDA), any such authority appropriated would be listed in the Budget.²

LEGAL RATIONALE

However appealing the foregoing, it does not adequately deal with the requirements of the section 3(a) (2) definition: certainty of expenditure; and the express exclusion of guarantees. Thus, since the authority appropriated to ERDA pursuant S. 2035 would be contract authority to be used for financial guarantees, and, since guarantees are excluded from the definition of budget authority, it therefore follows that commitments made pursuant to S. 2035 would not come within the meaning of "budget authority."

Moreover, because there is no assurance that guarantees would ever need to be honored, since the ERDA commitments contemplated by S. 2035 are to be used for guarantees, such commitments would also fail to satisfy the definitional criterion that the obligations "will result" in immediate or future Federal outlays. See, in this regard, the language and history of the Budget Act, above.

Furthermore, the legislative history of S. 2035 supports the view that the S. 2035 guarantee authority was not intended to be budget authority until such time as the United States is required to pay in the event of default. For example, during the Joint Committee hearings on the bill there was discussion of the alternatives that were available to implement expanded uranium enrichment facilities; one of which was to publicly finance the uranium enrichment opera-

² Even assuming such an intention on Congress' part in passing the Budget Act, S. 2035 would present a special problem. The bill authorizes financing equal to the face amount of the outstanding guarantees. That is, with an appropriation of \$8 billion in contract authority, ERDA would be authorized to borrow from the Treasury an amount equal to the authorized contracts. This appears to be an unusually high level of financing for a loan guarantee program, but it is in fact the amount of financing which the bill would authorize and therefore, might be considered the most reasonable available measure of the commitment of Federal financial resources.

tions. Thus, the following colloquy between Chairman Pastore and Dr. Seamans, Administrator, ERDA, took place:

"Chairman Pastore. You see, doctor, I was in on the beginning of this. The way this started, every one conceded that we needed an expansion of facilities. When we discussed this before the committee—this is some time back, I am going back to the genesis of this problem—we realized that this required a tremendous amount of money. *If you had to provide that money in the budget, it would throw the budget out of whack.*

"*So we began to search around and say: How can we expand this without putting a large sum of money in the budget? That was the genesis that established the policy of going private.*

"Now I tell you frankly if this is a job that private industry can do as well as Government, and even better, it ought to go private. The only question that is before this committee is that we ought to know exactly what we are getting into and we ought to make sure that whatever we do here now doesn't bind us, that if there is a bad deal that is arrived at in the opinion of the Congress that there is no way that we can extricate ourselves unless we put in a petition or a bill to repudiate it.

"I think if we put our heads together, and we are convinced that this is the right way for the Government to go *rather than put a big bunch of money in the next budget*, if this is the only way we can get this expansion for the time being, because the previous administration and this one here have been reluctant to come up with this money for the simple reason that there is a constraint on the budget, if this is the only way we can get the expansion, we can cut out a lot of the redtape, get down to the basics, find out what we are up against and go ahead and do it. But we have to be partners; we can not be adversaries because if we are adversaries nothing will happen. Is that clear?

"Dr. Seamans. It is clear, and I agree with it." Hearings at 52-53 (emphasis added.)

See also Hearings at 75.

While initial guarantees would not be required to be listed in the Budget, such contingent liabilities apparently would be noted in the Budget at a later time; that is, when default actually occurs. As described earlier, the liquidation provisions of S. 2035 authorize money to be drawn from the Treasury in return for notes issued by ERDA. S. 2035 specifies that such transactions are treated as public debt transactions:

"All redemptions, purchases, and sales by the Secretary of the Treasury of such notes or other obligations [from ERDA] shall be treated as public debt transactions of the United States."

Concerning the handling of public debt transactions, section 301(a)(5) of the Congressional Budget Act, 31 U.S.C. 1322(a)(5), states that the congressional budget resolution (and, therefore, the President's Budget) shall set forth the appropriate level of the public debt and recommended changes in the level of that debt. See section 601 of the Budget Act.

CONCLUSION

The language and legislative histories of S. 2035 and the Budget Act do not require the authority that would be granted pursuant to the bill to be regarded as "budget authority" within the meaning of the Budget Act.

As we have noted above, our comments on S. 2035 are based on the most tentative and preliminary knowledge of the details of whatever cooperative agreement ERDA may enter into in its capacity of what the hearings repeatedly refer to as "guarantor." Moreover, whatever may prove to be the specific details of the cooperative arrangement ERDA enters into as "guarantor," the prospect of such contract authority not being included in the Budget prior to default is not only relatively novel but also threatens to establish an undesirable precedent. While the Budget Act does not appear to forbid this result, it does not mandate it either.

We believe that for Congress to achieve the maximum effectiveness of the process it established to control the Budget, the amounts of authority approved by appropriation acts for cooperative arrangements pursuant to S. 2035 should be reflected in the Budget.

Sincerely yours,

ELMER B. STAATS,
Comptroller General of the United States.

GASEOUS DIFFUSION AND CENTRIFUGE-TYPE PLANTS

Dr. SEAMANS. The \$8 billion allows for the possibility of one gaseous diffusion plant, which would be similar to the plants we already have in operation in the Government. This plant would require guarantees of as much as \$1.4 billion. The remainder of the \$8 billion would be for three centrifuge-type plants plus inflation and contingencies. Centrifuge plants would be much more efficient from an energy standpoint. We are negotiating right now with four different concerns, one for gaseous diffusion and three for centrifuge-type plants.

ENERGY INDEPENDENCE AUTHORITY

As far as the Energy Independence Authority goes, perhaps Mr. Zausner would like to add to that.

Senator MOSS. Mr. Zausner?

Mr. ZAUSNER. Senator, I touched on it before, but I guess our rationale there is somewhat similar to the Nuclear Fuel Assurance Act. We see the EIA not as a permanent Federal agency, but as an agency that would exist 10 years and would then terminate its outstanding obligations and commitments. We see it in effect as a relatively short-term operation which would provide guarantees and financial assistance at the start of new projects, but then have those repaid at the end of its term when the projects are liquidated. Some of them will be high risk and will result in losses to the Federal Government, but on balance we see the corporations as not losing any significant amount of money.

There are a number of examples. One thing envisioned is that if a utility company was in such bad financial shape that it could not raise its own debt, that the EIA could step in and provide loans that the utility would build the facilities provided the State regulatory commission agreed in writing to provide rate increases to service the debt and pay it off.

Senator BELLMON. That is an invitation for all rates to rise, is it not?

SAFEGUARDS IN EIA

Mr. ZAUSNER. No; I do not think so, Senator. There are a couple of safeguards in the legislation to try and stop that. One, it does not allow the EIA in that particular case to provide any interest subsidy at all. In other words, the only interest rate it can charge is what a comparable utility with a decent operating level could get.

Second, this rate covenant that the utility commission would have to sign with the EIA is not a very popular one with the utility commissions, because as you might imagine, it restricts their flexibility to set the rates. It states that the utility commission must grant rate increases to pay off the debt.

Senator BELLMON. If they do not, what happens? There is no way you could force them to do that.

Mr. ZAUSNER. We can step in and set the rates, or we can go to court.

Senator BELLMON. You could set the rates?

Mr. ZAUSNER. It is a legally binding operation by the utility commission to agree to provide rates adequate to payoff the debt, and I

think that that would be enforceable in courts, or whatever. I do not see that as a problem. The idea was, and I do not believe it will be an incentive for utility commissions to jump into this, but that is an example of where there might be a specific commitment to a half-a-billion-dollar facility. I think the chances of loss are zero.

I think where the corporations may be involved in \$100 billion of projects, it will be putting up money at the front and getting it back at the end, and what is more important for the budget is to show the losses of the corporations and not the financial transactions.

As I also indicated in my opening remarks, the appropriations process would be used on the equity portion of the corporations to allow for a very specific congressional control over their investments which might lose money.

OFF-BUDGET FINANCING

Senator BELLMON. I am not sure I disagree, but this is a departure. Take some of the agricultural programs, for instance. The loss experience there is less than 1 percent, even down to one-tenth of 1 percent, and yet those are not off-budget items. Anytime we make a loan for a house or a farm, that shows up as an outlay.

Mr. ZAUSNER. Senator, there are examples of each type, the Federal Financing Bank and so forth. There are several types that are off-budget. It appeared to us that consistent with showing the costs to the Federal Government, but not off-stating those, and attempting to show the \$100 billion of transactions would be a much less accurate representation, if you will, of the actual operations of this corporation than showing the losses.

Senator BELLMON. From the standpoint of the Budget Committee, this sort of hides a very large drain on capital that we need to recognize in planning our work.

Mr. ZAUSNER. You are talking in terms of the borrowing required by the Treasury?

Senator BELLMON. Yes.

Mr. ZAUSNER. We do estimate specifically what the requirements are, and that is included in our estimates of the debt ceilings and borrowing required of the Treasury. The only distinction we have is that we do not think the borrowing by the Treasury are a measure of its losses, or costs of operation. So we tried to show those as distinct and separate.

Senator DOMENICI. Mr. Chairman?

Senator MOSS. The Senator from New Mexico.

COSTS OF IMPLEMENTING EPCA VERSUS BUDGET

Senator DOMENICI. I got here a little late and I would like to ask a general question first.

I understand from your testimony that you did address the differences in this budget, both from the standpoint of outlays and authority, versus a budget that would contemplate the full implementation of the Energy Policy and Conservation Act.

You discussed the differences generally.

On the other hand, there are some differences that are extremely important when you consider that we have to come up with functional targets here in a month.

Is it fair to say that you would be able to distinguish for our staff the differences in costs for implementing the Energy Policy and Conservation Act versus the President's budget in terms of dollars?

That has not been done, to my knowledge, to this point. Has it, Mr. Zausner?

Mr. ZAUSNER. That is correct, Senator, and I guess just before you came in I gave round numbers of what we expected to implement in the legislation.

The major budget impact is with respect to the strategic reserve and also with the allocation and continuation of price controls beyond 1977.

We provided some round numbers for those impacts, and in the next week or two we will try to get you those specifics in enough time so that you can have them for your budget resolution.

On the specific numbers, we are still resolving some of the policy questions which affect the details of those numbers, but in round numbers for 1977 it will exceed \$1 billion above what is in the 1977 budget to implement EPCA.

NUCLEAR ENERGY COSTS

Senator DOMENICI. If I understood both yours and Dr. Seamans' comment with respect to the apparent dollar emphasis on nuclear energy, you were not indicating your preference for it versus exotics, but rather stating the state of the art as you see it in terms of potential for on-line energy sources in the next 10 years.

Is that correct?

Dr. SEAMANS. What I was trying to get across is that we have had substantial effort in the nuclear field for 25 or 30 years, and we inherited a mature program where the activity was very much developmental- and demonstration-type work.

When a program has matured to that point, the annual costs are much higher than when a program is just getting underway and most of the work is research-type effort, as well as program planning and analysis.

For example, in the solar area we have started some work on solar furnaces, which is a fairly major development effort.

This, in turn, will lead to a 10-megawatt solar electric project, and that will cause the solar budget to increase substantially.

What we are really comparing here are programs that are in different states of maturity.

SOLAR ENERGY

Senator DOMENICI. Let me get on the area of solar energy for a minute and be specific about a program, Dr. Seamans.

I don't usually do it, but I think it is of importance across the board when we talk about the solar institute.

Am I correct that for 1977 you envision about a million dollars for that program, to get it started?

Dr. SEAMANS. Yes; we show that amount in our budget. We are formally announcing today the criteria for the Solar Energy Research Institute. This will be announced this afternoon. We are going to allow 120 days for proposals to be prepared and submitted to ERDA. It is our intention to make a selection of the management team and the locale during the calendar year.

Senator DOMENICI. You briefed Interior a while ago, and it fits your million dollar plan, but not what people envisioned as a much broader plan.

I don't want to ask it at this point, because I don't think it is relevant, other than the fact that you have a million dollars in there, which may not be what the Appropriations Committees envisioned for the first year.

Dr. SEAMANS. Other solar program R. & D. money will go to the institute for research work that they do.

Senator DOMENICI. I understand that.

Thank you, Mr. Chairman.

OFF-BUDGET FINANCING

Senator Moss. Let me ask another question on the off-budget matter which seems to be troubling us.

If we are asked to give a blanket authorization of that \$25 billion in equity capital, then Congress no longer has any supervisory oversight or control over the individual contracts that are made thereafter.

Is that correct?

Mr. ZAUSNER. Yes, but, Mr. Chairman, we have not asked for a blanket appropriation of that \$25 billion. We have asked for only a portion of that, only a third of it, and we would fully expect the Congress to exercise oversight authority after a year on what projects have been implemented and what their costs were, and in fact the corporation would be precluded from going ahead unless it received additional appropriations.

I think in a practical sense one reason why we have looked at that kind of authority is that it is very difficult today to lay out the specific projects for the specific kind of financial assistance that would be needed because much is going to be depending on what pops out of the R. & D. processes, and which ones can be done by themselves without financial assistance.

So, we need, on the one hand, a process of control, both for the executive and the Congress, which allows a periodic look, but on the other hand, I think it would be counterproductive to try and specify the exact 8 or 9 or 10 projects and what their exact terms would be and exactly how much money would be required for each.

I don't think the system could proceed that way. I don't think it is possible today.

Senator Moss. You prefer a sort of audit and oversight, after-the-fact look by the Congress. However, as a matter of fact, in other departments we insist on knowing in advance how the money is going to be used.

Mr. ZAUSNER. I think it is impossible today to say that here are the 14 contracts where the money will be loaned. I think that is not possible.

However, the idea of apportioning the equity funds not all at once, but on a piecemeal basis, you see how things work out so that the Congress has the oversight authority, and, plainly and simply, I think, the ability to shut off the equity appropriations process if it is unhappy.

I think there is provided a lever of control mechanism by the Congress over the operations, but I think it isn't, and I think it shouldn't be, on a kind of a project-by-project and public works kind of operation.

It is simply not that kind of a program.

NUCLEAR FUELS ASSURANCE ACT

Dr. SEAMANS. Mr. Chairman, in the case of the Nuclear Fuels Assurance Act, the individual contracts will be of sufficient magnitude of obligation like \$1.4 billion, each that it is felt the Joint Committee on Atomic Energy should have a chance to review the contract before proceeding. As a consequence each one of the proposed contractual arrangements will be reviewed by the Joint Committee on Atomic Energy. They will have 60 days to carry out the review and we have proposed a specific set of procedures as to how that review will take place.

Senator Moss. Senator Bellmon?

EQUITY AND LOAN GUARANTEES

Senator BELLMON. Mr. Chairman, let me see if I understand what we are getting into.

There is supposed to be \$75 billion of debt financing plus \$25 billion of capital stock.

Of the \$25 billion, you intend to use \$8 billion during the fiscal year 1977.

Mr. ZAUSNER. That is how much we would want appropriated in the first year.

I don't think the expenditures in the first year would eat that up.

Senator BELLMON. If you are going to spend \$8 billion, why not have it in the budget?

Mr. ZAUSNER. We are not going to spend \$8 billion. The corporation might make, in the first year, commitments to something like \$8 or \$9 billion of facilities, or loan guarantees. Actual outlays are probably only a few hundred million, even though commitments were made of \$8 to \$10 billion.

Actual outlays or money or actual loans which would actually be guaranteed would only be a few hundred million dollars.

Senator BELLMON. Then let us assume this committee is not going to agree with you that this should be off budget, and I frankly don't think we will?

Can you give us a breakdown of how rapidly you are going to need the money available?

Mr. ZAUSNER. Yes, sir, we will submit for the record the detailed commitments or at least a rough idea of their mix between equity and loan guarantees.

[The following was subsequently supplied for the record:]

ENERGY INDEPENDENCE AUTHORITY: FISCAL YEAR 1977 ACTIVITY (ILLUSTRATION ONLY)

[In millions of dollars]

	Commitments	Outlays
Loan guarantees.....	6,000	10
Loans.....	2,500	2500
Equity placements.....	500	150
Price guarantees and other.....	500	40
Total, fiscal year 1977.....	9,500	650

¹ No cash outlays as a result of loan guarantees.² 20 percent payout of loan commitments assumed.³ Early equity outlays primarily for synthetic fuels.⁴ No price support outlays assumed necessary in near-term.

LOAN GUARANTEE

Senator DOMENICI. Could I ask a question about the loan guarantee?

Aren't some of these in legal language apt to be what we call joint ventures, some of the potential projects or cooperative agreements?

Mr. ZAUSNER. Yes, and in fact some of them might be direct equity investments where the Government would put up equity funds for direct ownership in the project.

I think, however, we should try and stick with the loan guarantees for the overwhelming share of the overall activities of the EIA.

ON-BUDGET FINANCING

Senator DOMENICI. Would you not agree that, if they are joint ventures or cooperative contracts, even a strict interpretation of the letter of the act—the Impoundment and Budget Reform Act—would include them as on-budget items?

Mr. ZAUSNER. If you look at our budget it actually worked that way. In other words, here we make actual outlays, that is shown on the budget as a reserve for losses. In other words, we want to show on the budget whatever the percentage is that auditing firms think would be expected losses over the life of the loans in the budget in the year that audit is completed.

We are not trying in a very practical sense to avoid anything being on the budget. We think, in the accounting sense, what is realized or expected losses ought to be on-budget.

Senator DOMENICI. Thank you, Mr. Chairman.

Senator Moss. Senator Bellmon?

OIL AND GAS PRODUCTION

Senator BELLMON. At the present time our oil and gas production is going down pretty rapidly.

I have before me figures showing the number of rotary rigs down from February 1975 to February 1976.

The number of seismic crews operating now are down to about 250, when at its high point it was 330. This means people aren't looking for oil and gas as much as they were.

Does ERDA have any suggestion as to what we might do to get the domestic oil and gas industry geared up to do more again?

Dr. SEAMANS. I think this is a responsibility of the Federal Energy Administration. ERDA's role, as far as oil and gas is concerned, is primarily for the kind of work that you and I reviewed when we were down in Osage County, when we were looking at the tertiary recovery efforts. I don't believe it is in ERDA's purview to take direct action to increase exploration.

I think, personally, that there should be more exploration and I think we ought to be exploring the Continental Shelf and any other area where there might be more resources.

Mr. ZAUSNER. I could answer that specifically. I think on the numbers, one has to be careful on the drilling rigs for several reasons.

There has been a strike on the west coast which resulted in a number of rigs being idled in the last month or two.

Second, there tends to be a seasonal trend in the use of both rigs and seismic crews.

Senator BELLMON. These are both for February.

Mr. ZAUSNER. That trend existed for 10 years prior to 1974 and 1975. I mention that as a practical problem in interpreting the numbers.

CERTAINTY AND ADEQUATE INCENTIVES INCREASES DRILLING

There are two key things which are going to make drilling go up, and by our estimate unless it increases quite dramatically over the next 10 years.

One is certainty and the other is adequate economic incentive. On certainty, it is not surprising if the drilling is not going up. We have had talks of divestiture, which makes it very difficult for the industry to plan on what it is going to do if it doesn't even know if it can be in that phase of the operation.

We have had months of debate on rollback, and while the energy bill is better than when we started where people were talking about rollback to \$4 and new oil at \$7.50, but just talk of that has acted as a disincentive.

Finally, we have had the removal of the depletion allowance. We are now having discussion of the removal of the intangibles. So, we have a number of things working against adequate incentives to go as fast as the industry might to produce new oil.

I think we have to deal with that by getting a national energy policy and getting it quickly.

With respect to pricing, we are trying to remove that as much as we can in terms of implementation of the \$7.66 composite price and trying to provide adequate incentives on new oil to get people to look for it.

I might add, as you probably know, what we are now doing is going through the rulemaking of how to allocate this 150-percent increase each year among the tiers of oil, and we are going to be making a decision in the next 30 or 60 days as to whether the 10 percent is an adequate incentive for new oil production.

If we find it isn't, we expect to come before the Congress for additional increases above the 10 percent, if we think they are justified, and if the Congress doesn't disapprove those in the 15 days or whatever the time frame is, they would be implemented.

I am not surprised by what is going on, and I think our proposed policy, or actual policies, are what is causing it.

NEW OIL RESERVES

Senator BELLMON. You say this isn't ERDA's area, and perhaps it isn't, but has ERDA made a determination that there remain significant quantities of oil and gas still to be discovered?

The reason I ask the question is that other data I have before me show that the new oil reserves added per oil well is 150,000 barrels in the 5-year period between 1960 and 1965, and in the 5 years between 1970 and 1975, these reserves amounted to 221,000 barrels per well, roughly a third more.

Mr. ZAUSNER. Perhaps I could comment on that, Mr. Chairman.

You have to make a distinction between the two areas. One, the lower 48 States, where we have been drilling for a long time. In the lower 48 States, we fully expect that the declining finds per foot drilled are going to continue. We have found the most lucrative fields.

On the other hand, we think if higher prices are allowed to operate, then in the existing pools, through technology, we can substantially up the recovery rate, or the percentage of the total pool that can be recovered.

Those rates are a little misleading, because these focus on the lower 48 States and don't take account of what our policy is on exploration and development and bring to market the frontier areas, and the key to reversing that decline is not only adequate incentives in the lower 48 States, but what the Government's leading policy is, its transportation policy and the like for the offshore areas, the Pacific coast and the Atlantic coast and in Alaska.

Our best estimate is based on the USGS and that is that there are very, very substantial quantities of reserves that are yet to be discovered, more than has yet been proved, but they depend on adequate price to recover them, and Government policies for OCS leasing and transport and the like, which would allow the new reserves to be brought to market.

NUCLEAR PLANTS

Senator BELLMON. You gave us earlier figures showing we need 50 percent more petroleum, or energy, rather, by 1985, and that we could get it from nuclear plants or imports or coal.

By 1985, and I understand it now takes 10 years from the time a decision is made to build a nuclear plant and get it onstream, the ones we will have in 1985 will be those now in process.

Dr. SEAMANS. Yes, but we have 60 operable today, and we have another 69 that are under construction, and we have an additional number where licenses are being sought and work authorizations are being requested so they can start the construction.

A total of 238 plants are either operable, being built, or seriously being planned.

Senator BELLMON. So, those are the ones, if everything went well, could be in operation by 1985?

Dr. SEAMANS. Not all 238, but most could be in operation.

Senator BELLMON. Will the 200 of them be in operation by 1985?

Dr. SEAMANS. Seventy-two of those that are planned have reactors that are now on order; 21 do not actually have the reactors on order,

and I would doubt that the latter would be completed in 10 years. However, it might be possible.

Of significance, however, is that we have about 41,000 megawatts available from our existing plants.

The newer plants will all be of larger scale so that we are talking about a greater increase in the energy availability than just proportioning the number of plants.

Mr. ZAUSNER. I think to give you a specific number, we looked at that in the national energy outlook which we just released, and taking account of the existing leadtimes and all the deferrals that have now occurred, as Dr. Seamans points out, we have 41,000 megawatts of that would be about 26 percent of electric power.

8 percent of electric power, and by 1985 if we are at 140,000 megawatts, capacity online now, and by 1985, it would be 140,000 megawatts.

Senator BELLMON. Out of a total demand of how much?

Mr. ZAUSNER. On a percentage basis, that 41,000 megawatts provides 8 percent of electric power, and by 1985 if we are at 140,000 megawatts, that would be about 26 percent of electric power.

I might add that that 10-year leadtime is because of the way the current system operates. We think it is fully possible to cut that leadtime to 7 or 8 years instead of 10.

We have some legislation on the Hill to reform the Nuclear Regulatory Commission's siting procedures, and if that were done, you could get another 20 to 30 percent increase on line by 1985 by the plants that have already been begun, but because of the time can't make it by 1985.

If you speed them up, not only do you get more nuclear power, but the costs of each plant might be something of about \$100 million less because of being able to build it more quickly.

Senator BELLMON. By 1985, if everything goes well, 26 percent of the electricity might be coming from nuclear plants.

Now, then, realistically, there will be no new coal conversion plants by 1985. Isn't that about it?

Mr. ZAUSNER. Coal-fired plants?

Senator BELLMON. Coal conversion plants, gasification and liquification. We don't know how to do it yet. We don't have the first demonstration plant left. So, in 1985, there will be zero from gas or coal; is that true?

SYNTHETIC FUEL PROGRAM

Dr. SEAMANS. We feel we can and should move out on a synthetic fuel program that could build up to as much as a million barrels a day by the year 1985.

Senator BELLMON. How many barrels a day?

Dr. SEAMANS. A million barrels.

What we have requested—

Senator BELLMON. It takes time to do that, Dr. Seamans.

Dr. SEAMANS. There is no question that it is a very major effort.

Senator BELLMON. I think we have to stop dreaming and get down to facts. You don't have the first demonstration plant under construction; do you?

Dr. SEAMANS. We have a good sized demonstration plant currently under design.

Dr. McCORMICK. The time to build a synthetic fuels plant is not as long as for a nuclear plant.

There are a number of possible projects in the gasification area—

Senator BELLMON. I have been here now for 7 years. I have heard that same talk since I have been here. We haven't got one built yet.

Dr. SEAMANS. We had a chance to authorize such a program last December. At that time the Senate put an amendment on our fiscal year 1976 authorization which would have permitted us to move toward a 350,000-barrel-a-day equivalent synthetic program.

However, the House did not go along with that recommendation. The Committee on Science and Technology is getting ready for hearings on a bill that would move on a part of that program. It is still possible to realize some synthetic fuel in the year 1985, but we do need congressional action if we are going to do it. We can't do it any other way.

Senator BELLMON. But not anything like a million barrels a day. That is a pipe dream; isn't it?

Dr. SEAMANS. I agree that is very optimistic, but I believe if the country realizes how serious the situation is, there is still a possibility though time is running out.

IMMEDIATE ENERGY PROBLEM

Senator BELLMON. In your budget here, the total, and I am talking about outlays for 1977, the \$2 billion, there is very, very little that really will have an impact on our energy situation by 1985.

Most of this is stretched out well into the future. Conservation would have some, and solar energy, nothing can be done, and solar energy and fusion is the year 2020, and in fission, maybe by 1990.

We are really not doing anything to help with the immediate energy problem.

Dr. SEAMANS. This is a point that I have been trying to stress. When it comes to new technology, you have two time delays that you have to live with:

One is the time it takes to do the research and development, and to demonstrate the technology so that it is shown to be economically viable as well as technically feasible;

Second, is the time it takes to build enough of the plants to make a significant difference in our energy economy.

When you add the two together, you are talking about 20 or more years in some of these new technologies.

So, you shouldn't look to ERDA to provide major sources of new energy by the year 1985. It is going to take longer than that. We will do everything we can for the near term, but new technologies are not going to affect the energy balance by very much in that time span.

We have to make do with what we now have or we are going to be in desperate trouble by the year 1985. I mean we must use our coal and light water reactors and our oil and gas.

COAL-FIRED PLANTS

Senator DOMENICI. Would the Senator yield for a question there?

Obviously, coal-fired plants are an operation that will be on by 1985.

I wonder if you would comment on the state of the art in the scrubber technology?

Dr. SEAMANS. It was decided that the work on scrubbers would be continued in EPA so we are not doing any work on that. However, we are working on new methods for burning coal, we are working on fluidized bed technology that will permit the use of high-sulfur coal as a boiler fuel, and it could also be used in an electrical generating plant. So we are working on the next generation beyond the quick fix, put-the-scrubber-in-the-stack kind of effort.

Mr. ZAUSNER. But over the next 10 years we want to build the number of coal plants—if we build the number we want to, we cannot meet the timetables in the Clean Air Act. We have provided Clean Air Act amendments, which are not an attempt to change the goals or the objectives of the Clean Air Act, but just how quickly they are achieved. It is our belief that if we want coal production increased between now and 1985, we have to have the capability of giving compliance extension for individual powerplants, so that we can get the new coal-fired plants built.

If we don't, we don't think we are going to get them built.

Senator BELLMON. Let me get back to the point I was trying to make here.

Your projections, which are partly based on the hopes of what we are going to get with respect to the nuclear plants and the coal conversion, are I think idealistic and optimistic to a fault.

The projections here that go to 1985 show us now getting 58 percent of our crude oil from foreign sources.

Mr. ZAUSNER. That is within the realm of possibility.

Senator BELLMON. In 1985, then, we would be getting 70 percent from abroad?

Mr. ZAUSNER. I agree.

Senator BELLMON. That is an intolerable situation.

IMPORT DEPENDENCE

Mr. ZAUSNER. Senator, you and I are in agreement. If we don't take action to rely on the existing sources and implement legislation to use what we know how to use today, 70 or 75 percent import dependence by 1985 is very simple.

But I would add one thing. It is not because Bob Seamans' program is not going fast enough, or that we can make it go faster—

Senator BELLMON. But there is nothing in this budget that indicates that Bob Seamans wants to go faster.

Mr. ZAUSNER. And for good reason. That is not the way to change the 75 percent import dependence in 1985. What is required between now and 1985 is not a Federal role program, but getting the situations right for environmental controls and allowing leasing on the OCS so we can reverse the decline in natural gas production, allow coal for use in powerplants, and allow us to build nuclear powerplants.

If we do that without any major contribution from R. & D., that 75 percent dependence which translates into 15 million barrels a day, roughly, of oil, I believe could be cut to less than 5 million barrels a day, without the new technology. But we are not going to do it unless there is a price incentive for production and we are allowed to use coal for nuclear power.

Senator BELLMON. You mentioned Congress has to act. The things

you enumerated, has ERDA or the administration packaged these and asked Congress to do these things?

Dr. SEAMANS. We certainly have.

ENERGY INDEPENDENCE AUTHORITIES

Mr. ZAUSNER. We submitted the Energy Independence Authorities.

Senator BELLMON. You get all this rhetoric—

Mr. ZAUSNER. I am not talking about rhetoric. I am talking about the Naval Reserves and clean air amendments and insulation tax credits and mandatory building standards, coal conversion authorities to force more plants to burn coal instead of oil, impact assistance programs, so that the local community which has to bear the brunt of Federal development could get help from the Federal Government at the front end. Hopefully, that would remove some of the problem.

The legislation that the President submitted about a week ago to make sure that we get a decision within 1 year on an Alaskan gas transportation system so that the gas that we know now is up there along with the oil, and when we start producing the oil you have to reinject or burn it, could find a way down to where we need it.

There are any number of concrete proposals. I am convinced if we got them passed we wouldn't be at 75-percent dependence.

PUBLIC EDUCATION

Senator BELLMON. One more question, Mr. Chairman.

The only thing I would suggest is that ERDA ought also to take on the responsibility for public education. There is in this country a vast amount of ignorance about where we are in energy and a lot of this talk about how we are going to do these wonderful things, solar and geothermal and all that. Most of it is beyond the practical realm of possibility.

Could we put in here some money and give ERDA responsibility for trying to educate the public as to what the threat is and as to what actions have to be taken? Is that something you can do? I think it would be a very credible thing, and your agency is the only one I know of which has the knowledge and the ability to get people to believe.

Dr. SEAMANS. I think something should be done with the FEA.

Last fall, when the amendment was sent to Congress, I think it was \$26 million for the FEA for public information programs and conservation, and that amendment was not passed.

I think there is need for additional effort by both FEA and ERDA for us to emphasize what is being done in research and development and what the long-term prospects are, and for the FEA, which has the everyday responsibility, to indicate where we stand now.

OMB CUTS ERDA CONSERVATION BUDGET REQUESTS

Senator Moss. I understand that OMB cut ERDA's fiscal 1977 budget authority request for conservation activities by 50 percent, and the solar energy programs by 41 percent, respectively. Did OMB provide ERDA with a rationale for these cuts, and, if so, what was it?

Dr. SEAMANS. As you know, the budget process is such that we submit our request to OMB and we indicate what we think can be done sensibly to move ahead as rapidly as possible.

The OMB has to look at this request from the standpoint of the total budget and total fiscal constraints, and for that reason it is a give-and-take effort.

Now, the negotiations with OMB in the solar area got specifically into the matter of heating and cooling, and in that particular area, the OMB felt that we should not have as broad a program as we had requested. On the other hand, when you look at solar electric, we have a 50-percent increase, which is close to what we had recommended. We recommended moving ahead more aggressively in the ocean thermal gradient area but that was reduced.

In conservation, one particular area that was reduced that we felt very strongly about had to do with improved conservation efficiency, and in particular work on the fuel cell. This was taken back to below a minimum level from our standpoint.

Senator MOSS. You obviously thought that you had capacity to do work that OMB cut back. If additional funding for conservation efforts were added to your budget, do you have the capacity to use it?

Dr. SEAMANS. There is no question that the program could be carried out.

CROWDING OUT

There was another point that I should mention, and that is the question in some of the nearer term areas as to whether it is appropriate for the Government to be engaged in the effort, or whether Government participation will tend to cut off private capital and hence not move as rapidly as we might in the private sector.

Senator BELLMON. Mr. Zausner, as part of our crystal ball gazing function, we have to try to project offshore receipts for the various fiscal years.

Does your agency participate in preparing these estimates?

Mr. ZAUSNER. That is the Interior Department.

Senator BELLMON. Do you have any knowledge on the projections, or any feelings with the projections? It has been projected that we would get \$6 billion in OCS receipts next year. Would you think this is a reasonable suggestion?

Mr. ZAUSNER. I wouldn't have a way to comment on that, Senator.

COST OF INCREASED IMPORTATION OF OIL

Senator BELLMON. If we become dependent for 70 to 75 percent of our requirements in 1985, what would that cost us in terms of foreign exchange? You said 15 million barrels a day?

Mr. ZAUSNER. Today we import 6, and that is \$27 billion. So in round numbers, it would be about \$60 to \$70 billion.

Senator BELLMON. That is assuming the price doesn't go up.

Mr. ZAUSNER. That is the other key point. We are now at 6 million barrels a day, and we have watched the Middle Eastern countries raise the price, and they are going to be meeting this summer, and I think they will do it again. If we let our imports go up by a factor of two and a half, their capability to raise the price even more exorbitant than now is even further magnified.

I think unless we reverse the trend, any hopes for stabilization or a drop in oil import prices are just a pipe dream.

Senator BELLMON. I don't know that the answer to our problem is to put more money in your budget.

ERDA'S RESPONSIBILITY

Mr. ZAUSNER. That is not what we are asking.

Senator BELLMON. But it scares me that we are not doing enough in the energy area. I don't know that it is ERDA's responsibility to advise us, but I would certainly encourage you to not be satisfied to send up a program, and have it fail and not do anything. Congress will do whatever the public wants done, and once the public is alert to the problem, I think they are going to demand that we take appropriate action.

Dr. SEAMANS. I think it is the responsibility of several agencies to advise Congress. I think ERDA has a major responsibility, and we are trying to do that. We have contact with some 30 different committees of Congress. It is also up to the FEA and the Department of the Interior. I think we are working in a coordinated way, and that we are getting a chance to advise the Congress that we are in a very, very serious predicament.

BUDGET AUTHORITY

Senator Moss. Dr. Seamans, the 1976 budget authority mark, the second concurrent resolution for function 300, was set at \$18.7 billion, which is \$1.5 billion above the administration's original February 1975 request.

The 1977 budget submitted this January by the President shows a 1976 budget authority in function 300 to be at \$18.9 billion, which is \$2.2 billion above the second concurrent resolution mark and a number that includes proposed legislation including \$500 million in synthetic fuels.

Given the fact that the second concurrent resolution is to be the principal determinant of Federal spending boundaries, should not funds for these additional proposals be considered as part of the 1977 budget?

Dr. SEAMANS. I think the numbers that you are referring to, Mr. Chairman, cover much more than just the ERDA budget. I believe they cover—

Senator Moss. All of budget function 300, yes.

Dr. SEAMANS. I can only comment on those that relate directly to ERDA.

SYNTHETIC FUELS

Senator Moss. Dr. Seamans, well, the synthetic fuels is an ERDA function, of course, and—

Dr. SEAMANS. As far as the synthetic fuels program, we do recommend this be included in the 1976 budget, that there be a loan guarantee authority of \$2 billion, budget authority of \$503 million, and \$3 million of actual outlay. The outlays are to support the administration of the program. We urge that it be included so we can get started on a synthetic program. I know it is unlikely that we will get to a million barrels a day by 1985. We could perhaps achieve half of that. We won't achieve any of it unless we get started.

DEPENDENCE ON IMPORTED FUELS

Senator Moss. The thing that you have underlined for us so strongly this morning is the continuing problem that we have of being more dependent on imported fuels. This poses two threats for us. One, we are vulnerable to another embargo and second is the economic effect of the outflow of money, estimated to be \$25 to \$30 billion a year now, for the purchase of imported petroleum. That figure for outflow increases as imports continue to climb. Moreover, the outflow figure is also increased by price changes, which always seem to be under consideration by the exporting countries and by inflation.

So we do need a very sharp increase in domestic effort on both conservation and domestic production—immediate and long-range.

Mr. ZAUSNER. Absolutely, and you have to keep in mind that many of these things take 7 to 10 years to reach fruition. So you don't lease an OCS parcel today—if you lease it today, it is still 7 or 8 years until the oil starts to flow. So, the later we are in setting the policies, the more we slip beyond 1985 before they have impact.

DECLINING OIL RESERVES

Dr. SEAMANS. Right now we have roughly 6 percent of the world's population, and we are using about a third of the world's energy. It is inconceivable to me that this can continue if it means we have to import more and more because other nations also need energy. In Europe, they have a more serious problem than we do and they are going to be importing more oil. The oil reserves, even in the Middle East, are going to be depleted at some point, and it seems to me we have to get ourselves in a posture where we are not so dependent on the world for energy, but we are in a position where we ultimately will be able to export energy rather than to import it in such large amounts.

Senator Moss. Surely we will continue to compete with Europe and other energy consuming countries for the imported petroleum we are bringing in now. Europe will need more.

Dr. SEAMANS. Japan needs more.

Senator Moss. These requirements will continue to rise.

EIA—10-YEAR PLAN

You said earlier, Mr. Zausner, that the EIA would self-destruct in 10 years. You don't think that by 10 years we are going to be out of this problem, do you?

Mr. ZAUSNER. No, sir; I don't, but on the other hand, I think the major thrusts of what we have to do now in order to develop the existing sources for this 10 years and prove the new technologies and get them so they are starting to work by 1985 for the period of the year 2000—I didn't think we wanted to set up a new thing to let it go indefinitely. I have a hard time figuring out what I need to do next month, let alone what organization we need in 1992. And I think it would be nice for a change if we set one up that we set one up in this way.

Senator Moss. Sort of go on a 10-year plan?

Mr. ZAUSNER. Well, I don't like to do that, either.

Senator Moss. Dr. Seamans, you indicate that your budget requests have to go through OMB. They review and act on them before the requests are finalized and sent to Congress. But, the cuts in some of your requests were very severe, 50 percent and 41 percent for conservation and solar efforts respectively. Are we failing to make the case—to tell the story to OMB—as to what kind of trouble we are in?

FUNDING RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROJECTS

Dr. SEAMANS. I think there is a fundamental difference in point of view, and I think they recognize that the Nation has a problem and the Nation must carry out quite a few different projects in research and development and demonstration, and I think the real issue is how it ought to be funded and to what extent should the taxpayer be responsible and to what extent should private capital be used.

From my own vantage point, I think we have reached a situation where the problem is so serious that the taxpayer should put up a larger amount than might otherwise be justified. I am afraid that we are not going to move fast enough unless we increase the Government's research and development budget rather substantially over the next few years.

ENERGY RESEARCH STRATEGY

Senator Moss. Our present energy research strategy seems to be to invest in promising areas, geothermal and so forth, as well as continued emphasis on nuclear power.

This approach seems appropriate for now, but when are the decision dates to occur? When must we prune the less promising approaches and make the decisions that will really shape our energy effort? How long do we have to make modest Federal investment before we must fish or cut bait? Is it 2 year, 5 years, or what?

Dr. SEAMANS. You must look at this on a project-by-project basis. I agree we can't continue to increase the funding for every development activity. At some point we do have to fish or cut bait.

NUCLEAR PLAN

For example, in the nuclear area, we have a plan that would put the breeder demonstration plant on line in 1983. It would provide for 2 years of operation, provide for additional environmental work so that a decision could be made 10 years from now as to whether we should commercialize the breeder technology.

We are in the process of working out such a plan in every one of our program areas. By this process, which we call Project Approval Documents, we will have the information that can permit a decision to be made as to whether to move on a technology to commercialization or not.

We could discuss any one of the areas you have mentioned and show you the specifics that we have in mind, what data we think will be required to make the decision, and when that will be achieved.

CROWDING OUT INVESTMENT FUNDS

Senator Moss. Another question regards funding.

Will it make any difference in the private investment market whether these projects are handled on budget or off budget? Will it tend to crowd out investment funds if the Federal Government reaches out for an amount of capital of this magnitude?

Mr. ZAUSNER. As I understand it, Senator, whether it is treated on budget or off budget won't change the amount of borrowing the Treasury will have to do. That is only an accounting function, if you will.

We have looked quite carefully at the crowding out question, and we have looked not at the fact that all that \$100 billion will not be borrowed. Much of it will never be borrowed, as I indicated. If the Federal Government provides a price support, there may never need to be transactions in the capital market.

Second, if we need to look at how it can be financed over a number of years, we don't think its impact on the capital markets will be very significant.

Senator Moss. That will complete our hearing for this morning. It was very interesting, and one that is a little sobering when we come to grips with this energy problem. We tend to recognize the peril we are in, and yet I think what Senator Bellmon was trying to emphasize in his line of questioning is very true. The man in the street no longer sees any kind of an energy problem. He can get his gasoline by driving up to the pump, and he pays a higher price for his gas or to heat his house, but except for higher prices it isn't clear that one is much concerned or that a full appreciation of the seriousness of the problem.

Some way or other, we have to convey to our people the terrible crunch that is down the road unless we find an effective remedy.

I appreciate your testimony, and this committee is anxious to do whatever it can to focus on this matter so that we can find ways for both immediate alleviation of the problem and long-range solutions to it.

Thank you very much.

[Whereupon at 12:07 p.m., the committee recessed, to reconvene Tuesday, March 16, 1976, at 10 a.m.]

WRITTEN QUESTIONS FROM COMMITTEE MEMBERS TO WITNESSES AND THE RESPONSES

Senator Moss to FEA Administrator Zarb and ERDA Administrator Seamans (Jointly)

AIM AND PRIORITIES IN PRESIDENT'S ENERGY PROGRAM

Question 1. What is the aim and what are the priorities in the President's overall energy program? For research? How does this budget compare with the agencies requests? To what extent does it reflect a difference in priorities? What are the key decision points in the major fuel areas (solar, geothermal, synthetics, fossil, and nuclear) over the next five years? Does the fiscal year 1977 budget represent any major commitments to particular energy fuels (e.g., synthetic, nuclear) or programs?

Answer. The answer to this question is limited to the federal energy RD&D Program. In general, the RD&D priorities of this year's budget remain essentially the same as last year's (reference ERDA-48) with the exception of the conservation technologies which are now judged to be the highest national priority. In particular, the federal fiscal year 1977 energy RD&D budget reflects:

An increased emphasis on conservation (efficiency) technologies which are now judged by ERDA to be the highest national priority;

Continued emphasis on closing the nuclear fuel cycle; particularly, with respect to waste management and chemical reprocessing;

Certain components of geothermal and solar heating and cooling receive emphasis with respect to creating an industry infrastructure to support them. Specifically, the geothermal technologies are hydrothermal and geopressurized applications;

The synthetic fuels program reflects the continued necessity to create the potential for an industry in the early 1980's. This will require some supplemental authorizations with respect to local imports and loan guarantees; and

Key decision points in next five years:

Nuclear

Industry decision to construct and operate next increment of enrichment capacity.

Federal support to industrial reprocessing technology.

Waste solidification specification and technology, and location for Federal waste repository.

Solar heating and cooling.—Nature and scope of Federal programs as a result of demonstration programs (1979).

Solar electric.—Major direction(s) of program based on economic feasibility experimentation over broad range of potential applications (1982).

Geothermal.—Focus of Federal program efforts resulting from incentive initiatives and research.

Synthetics.—Initiation of second phase of program that would increase capacity to 600,000 barrels/day equivalent (1979).

Fossil.—A series of decisions to construct and operate coal-to-synthetics demonstration plants designed to prior process technology and economics.

Finally, the fiscal year 1977 budget represents a continued commitment to a broad based development of energy technologies, both for demand and supply using the following strategic framework:

NEAR TERM (NOW TO 1985 AND BEYOND)

Increase the efficiency of energy used in all sectors of the economy and extract more usable energy from waste materials.

Preserve and expand major domestic energy systems: coal, light water reactors, and gas and oil from new sources and by enhanced recovery techniques.

MID TERM (1985 TO 2000 AND BEYOND)

Accelerate the development of new process for producing synthetic fuels from coal and extracting oil from shale.

Increase the use of under-used fuel forms such as geothermal energy, solar energy for heating and cooling, and extraction of more usable energy from waste heat.

LONG TERM (BEYOND 2000)

Permit the use of the essentially inexhaustible resources: nuclear breeders; fusion; and solar electric energy from a variety of options including wind power, thermal and photovoltaic approaches, and ocean thermal gradients.

Provide the technologies to use the new sources of energy, which may be distributed as electricity, hydrogen, or other forms throughout all sectors of the economy.

COST TO IMPLEMENT ENERGY POLICY AND CONSERVATION ACT

Question 2. What will it cost to implement the Energy Policy and Conservation Act signed by the President in December? How much of this will be required to establish the oil reserve—for conservation measures, for developing new underground coal mines, and other provisions of EPCA?

Answer. The estimated costs in fiscal year 1977 to implement the provisions of the EPCA as they impact on the FEA budget total \$573.2 million/\$960.7 million. Of this amount, \$480 million/\$850.4 million is to support the strategic petroleum reserve program; \$51.3 million to support additional conservation programs; \$0.3 million for the new underground coal mine loan guarantee program; and \$41.6 million/\$58.7 million for costs of other new or extended programs mandated by the EPCA.

ADMINISTRATION'S ESTIMATE OF RECEIPTS

Question 3. What is the Administration's estimate of receipts by major source of revenue (e.g., power sales by TVA, fees for nuclear fuel enrichment, sales of oil from naval petroleum reserves, and OCS leasing, etc.)? What is the likelihood of achieving these estimates? How will the deficit be affected if receipts fall short of the estimates? What are the pro's and con's of financing the energy proposals via an off-budget or on-budget basis? Why and for what energy projects is government, financial assistance required? What type of financing is proposed (e.g., loans, loan guarantees, price supports, tax expenditures, and direct spending), and how much of each is required?

Answer. Revenues generated by ERDA include the following: (\$M)

	1976	1977
Uranium enrichment.....	\$591.5	\$539.1
N reactor steam.....	22.3	22.5
Sale of source and special (SS) nuclear materials.....	17.9	13.8
Sale of isotopes.....	3.4	3.9
Charges for SS material consumed.....	8.6	9.4
Other revenues.....	26.1	26.4
Total, ERDA.....	670.0	615.1
Legislative proposal-repricing.....	21.7	90.8
Total.....	691.7	705.9

ERDA feels confident that the projected revenues will be achieved.

Details on revenues from TVA, petroleum reserve and OCS sources are not available to ERDA.

PRO'S AND CON'S OF FINANCING ENERGY PROPOSALS

Question 4a. What are the pro's and con's of financing the energy proposals via an off-budget or on-budget basis?

Answer. Most of the programs contained in the President's energy program are financial "on-budget." In fact, all of ERDA's research, development and demonstration programs are "on-budget." Since most of the guarantees for energy projects made under the President's proposed Energy Independence Authority (EIA) will not result in actual Government expenditures, it is advantageous to handle only net losses from such guarantees in an "on-budget" fashion. The advantage of this approach is that large contingent, although unlikely, liabilities are not misrepresented in the budget as probable Government expenditures. Furthermore, since it is the objective of EIA to be self-liquidated within a 10-year period, it is more appropriate that its accounting structure be similar to a business rather than the Federal budget. This simply means that net losses or revenues are handled in an "on-budget" fashion rather than separately accounting for gross liabilities and gross revenues.

ENERGY PROJECTS FINANCED BY GOVERNMENT

Question 4b. Why and for what energy projects is Government, financial assistance required?

Answer. There are a variety of potential energy projects which may require Government assistance because of the larger risks associated with commercializing emerging technologies or because of unusual financial or market constraints. Synthetic fuels projects are the best examples of emerging technologies that represent higher than normal business risks because of economic, environmental, regulatory and other uncertainties associated with introducing first-of-a-kind plants. More conventional energy projects, which are also important to achieving reduced levels of dependence on foreign oil may also require some financial assistance. Such assistance will be needed in instances where sufficient capital cannot be raised, for example, by a regulated utility, or where the rate of return is inadequate or is uncertain enough to deter private investment. These projects could conceivably include power plants, pipelines, and other energy-related, highly capital intensive projects.

PROPOSED TYPE OF FINANCING

Question 4c. What type financing is proposed (e.g., loans, loan guarantees, price supports, tax expenditures, and direct spending), and how much of each is required?

Answer. It is expected that most of the financial assistance to be provided by EIA would be in the form of loan guarantees or direct loans. These financial incentives particularly address the problem associated with obtaining adequate amounts of investment capital. In certain areas, such as synthetic fuels which must compete in unregulated markets, there may be a need to offer price guarantees. Although EIA will also have the authority to make outright grants, it is expected that this authority will be used only in unusual circumstances where direct subsidization is necessary. This might possibly be in areas of new technology commercialization, for example, solar energy.

PRINCIPAL RATIONALE FOR EIA PROPOSAL

Question 5a. What is the rationale for the Administration's proposal to increase reliance upon the public sector by creating a new Federal energy agency—EIA—with plans for considerable financial resources to intervene in the private sector. Is this consistent with the Administration's proclaimed goal of reducing the size of Government and drawing on the strength of the private sector?

Answer. The principal rationale for the EIA proposal is to provide a public financing mechanism that will ensure that all energy projects important to reducing U.S. dependence on foreign oil can obtain adequate financing over the next 10 years. Although the EIA does represent a Federal intervention into the private sector, such intervention is believed to be necessary for reasons of national security and economic stability. Although the EIA will result in modest administrative overhead, thus slightly increasing the size of Government, it should be emphasized that this Authority is a temporary institution that would be self-liquidating and would cease to operate after 10 years. Thus, it should be viewed as a temporary measure aimed at addressing special energy financing

problems in the 1970s and early 1980s when the U.S. will be most vulnerable to disruption of its energy supplies.

FEDERAL FINANCING IMPACT ON PRIVATE SECTOR

Question 5b. If the Administration's energy proposals are adopted, what will be the impact on the private sector of such large Federal financing requirements?

Answer. There is no question that the EIA will result in investments in energy projects that otherwise would not have been made. That is why EIA is needed and will also impact private capital markets by directing capital to energy investments. However, it should be emphasized that without adequate sources of energy and adequate security of those sources, the capital needed to support the entire U.S. economy will not be generated. The capital investments that need to be made in the energy projects to be financed by EIA are, therefore, of high national priority and deserve to have first call on available capital. It should be noted, however, that the \$100 billion or \$10 billion per year on the average that EIA will have available, represents only $\frac{1}{4}$ of our total annual national energy investment and $\frac{1}{20}$ of the total national capital investment annually.

URANIUM ENRICHMENT—RISKS OR GAINS OF PRIVATE INDUSTRY

Question 6. What are the risks or gains in allowing private industry to enter the Uranium Enrichment business?

Answer. In general, the risks to the Government are no greater, and the financial exposure potentially much less, in allowing private industry to enter the uranium enrichment business. We believe that there is no greater technological risk in allowing private industry to enter the business than if the Government were to construct new enrichment projects. The same technology base would be employed in either case and the same experienced Government personnel would be utilized in either case to insure that the projects would work. (The Government resources employed for private projects would be on a basis that recovers all Government costs of providing those resources.) Equally effective controls with respect to sensitive technology and safeguards would be maintained in either case.

On the other hand, there should be substantially less financial risk and exposure to the Government in allowing private industry to enter the uranium enrichment business than would be the case if the Government constructed new plants. We expect that the normal case in following the private industry route would be that projects would be completed and operate as private projects thus avoiding the many billions of Federal outlays that otherwise would be required. Even in the highly theoretical and unlikely case that the Government were obligated to take over all private enrichment projects constructed under the NFAA at the point of maximum Government financial exposure for each project, the Government exposure would then be only approximately the same for the private industry route as for the Government construction route.

The chief gains in allowing private industry to enter the Uranium Enrichment business are as follows:

(1) Uranium enrichment is basically industrial in nature, supporting the generation of electric power—a non-government activity. Thus enrichment would be placed in the proper sector of the economy.

(2) Multi-billion dollar Federal Budget outlays, recoupable only after a lengthy period, would be avoided.

(3) The development of a private competitive enriching industry, which is the purpose of the program, will result in incentives, through competition, which should produce savings to customers.

(4) The Nation's uranium enrichment supply base would be broadened and strengthened.

(5) There should be greater sensitivity to, and a quicker reaction time to accommodate, the market requirements.

(6) The Government would continue to maintain full control over use and dissemination of the technology, export of enriched uranium and safeguards—related aspects of the operation. In particular, no domination or control by foreign entities nor access to classified information by foreign parties would be permitted. From a "control" point of view the situation

would be permitted. From a "control" point of view the situation would be essentially equivalent to what now exists for Government enriching plants. The private projects all would require licensing by the NRC.

(7) This would free limited government funds for other urgent nuclear fuel cycle needs.

S. 2035 PASSAGE

Question 7. If Congress passes S. 2035, what are the major steps which must be taken to implement the legislation and what is the time schedule envisioned for such actions?

Answer. Immediately after passage of S 2035, ERDA will request provision of contract authority in the amount of \$8 Billion. Congressional action on the request would be based upon hearings and recommendations of the Appropriation Committees of both Houses.

ERDA will submit the unsigned proposed cooperative arrangement for each particular private enrichment project to the JCAE for Congressional acceptance or rejection in a manner stipulated in the Bill. It is expected that the proposed cooperative arrangement covering the UEA project could be submitted in 60-90 days after passage of the Bill, and the arrangements covering the prospective centrifuge enrichers could be submitted by the beginning of fiscal year 1977 or shortly thereafter, assuming passage of the Bill in the next few weeks.

PROPOSED AUTHORITY AND SPENDING FOR ENERGY R. & D.

Question 8. What is the total amount of authority and spending proposed in fiscal year 1977 for energy R&D in the following areas: fossil fuels, solar power, geothermal power, environmental control, and energy conservation? How will it be financed (e.g., loans, loan guarantees, price supports, etc.) overall and by project?

Answer.

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION—FISCAL YEAR 1977 BUDGET REQUESTS SELECTED PROGRAMS—BUDGET AUTHORITY

[Dollar amounts in thousands]

	R. & D.	Loan guaranty
Fossil	477.3	0
Solar	160.0	0
Geothermal	50.1	50
Environmental control	16.1	0
Conservation	120.0	0

OUTLAYS INCREASE IN ENERGY R. & D. PROGRAMS

Question 9. Apparently there is a 30 percent increase in outlays (about \$0.7 billion) for direct energy R&D programs. How does this compare with the nation's capacity to effectively conduct research in the time frame (fiscal year 1977 and the out years)?

Answer. In arriving at our fiscal year 1977 budget we examined the question of research capacity on a program-by-program basis. It is a particularly important question for entirely new areas of technology. We are convinced that the capacity is there in every case.

Perhaps I can put the question into context by making two points:

(1) If historic trends continue, the total R&D spending in the U.S. during fiscal year 1977 will be roughly \$40 billion. ERDA's \$0.7 billion increase represents a less than 2 percent perturbation on that base.

(2) In constant dollars, our national expenditures on R&D actually peaked in 1968. It has actually declined slightly since that time. As a result our technological resources, including trained scientists and engineers, have been underutilized in recent years. The urgent need for new energy technology comes at a time when the pertinent resources are relatively underutilized.

ERDA BUDGET PROPOSALS

Question 10. ERDA budget proposals indicate an increased effort on nuclear R&D over non-nuclear R&D. How does fiscal year 1977 spending compare with that of fiscal year 1976 on waste management, fuel re-processing, and safeguards against thefts of nuclear materials?

Answer.

	Budget outlays		
	1976	1977	Percent increase
Energy R.D. & D.:			
Nuclear.....	\$909,000,000	\$1,295,000,000	+42
Nonnuclear.....	\$506,000,000	\$699,000,000	+33
Waste management R. & D. commercial.....	12.2	62.8	+415
Fuel reprocessing R. & D.....	32.0	54.2	+69
Safeguards R. & D.....	14.7	27.3	+86

In addition to the above, the following amounts are included for the management of ERDA generated wastes (Pu reactors) :

Interim storage.....	50.9	61.5
Long term storage R. & D.....	18.6	30.3

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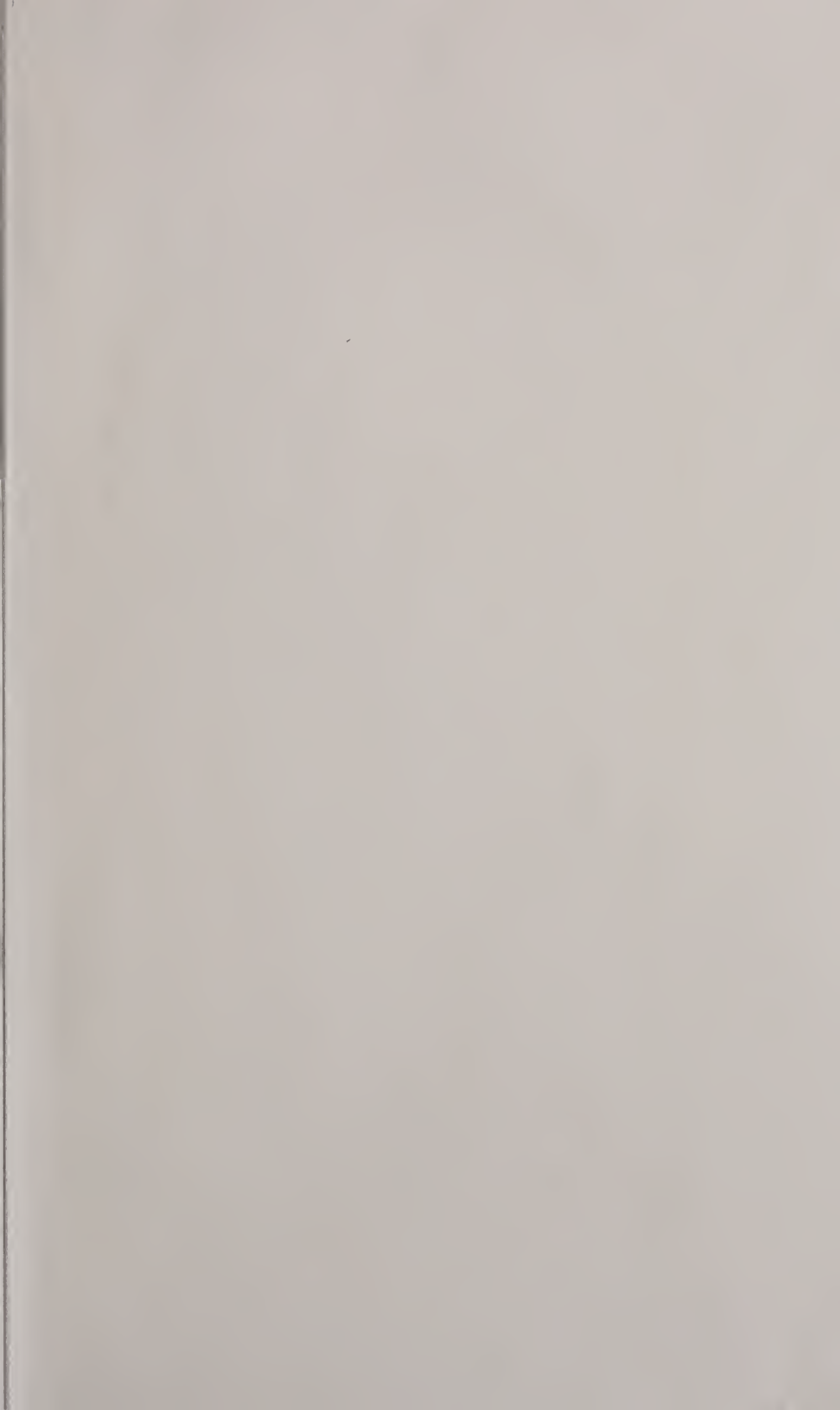
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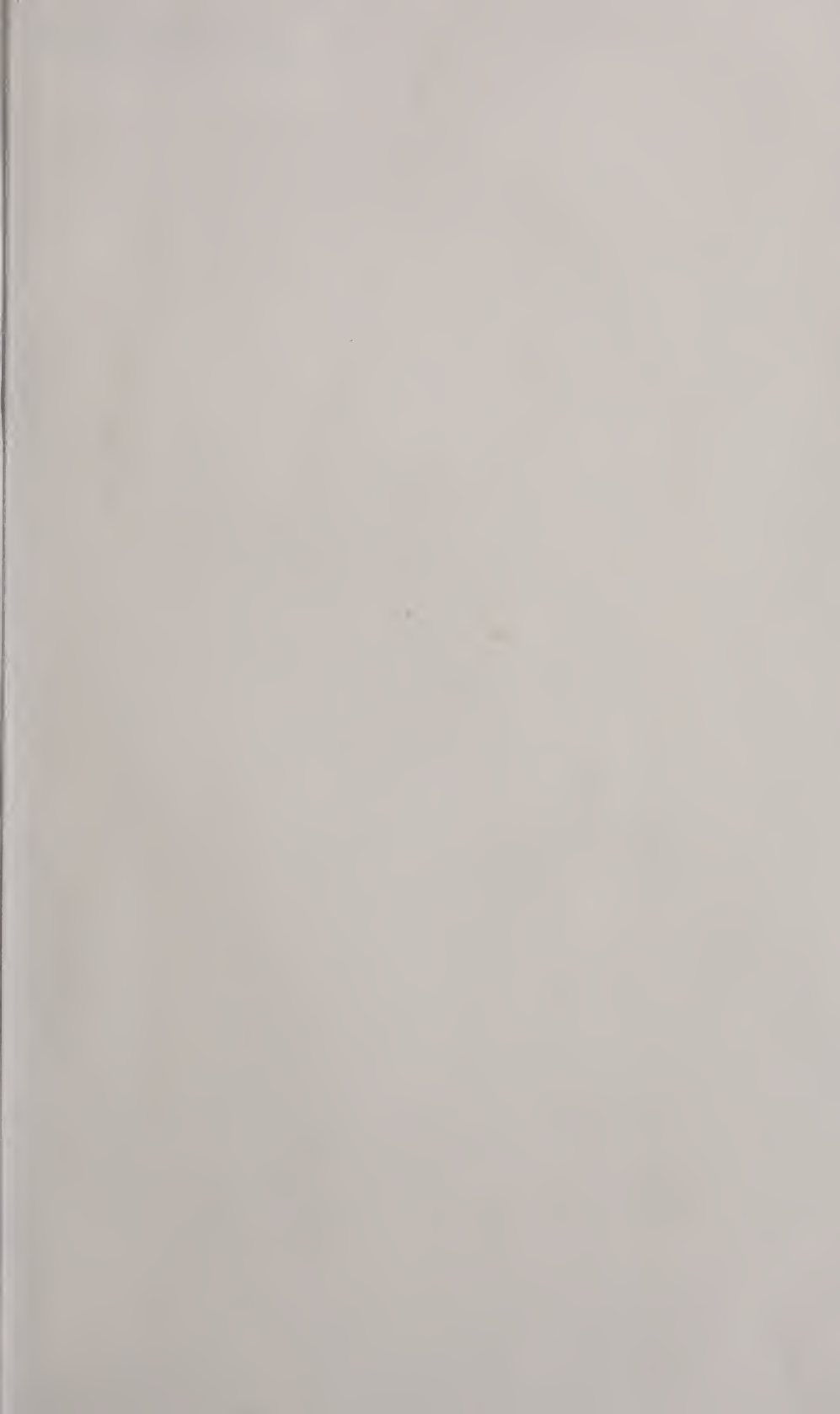
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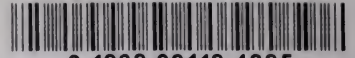
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